SECONDARY SCHOOL TEACHERS' BELIEFS AND INSTRUCTIONAL COMPETENCE IN USING INFORMATION AND COMMUNICATION TECHNOLOGY (ICT)

By

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NATIONAL UNIVERSITY OF MODERN LANGUAGES, ISLAMABAD

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ABSTRACT

Thesis Title: Secondary School Teachers' Beliefs and Instructional Competence in Using Information and Communication Technology (ICT)

The aim of the present study was to find out the teachers' beliefs and instructional competence of using Information and Communication Technology **(**ICT) in their teaching in public and private sector secondary schools. Further analysis was carried out to compare gender differences in using ICT and availability of ICT facilities at public and private schools. Present research followed the quantitative approach with survey design. Proportionate stratified random sampling technique was used, and data were collected from each stratum of public; private; male and female. The sample consisted of 1253 secondary school teachers. The study was descriptive in nature. For date collections, the researcher adapted the UNESCO ICT-CFT, (2011) (United Nation Education Scientific and Culture Organization) questionnaire. Data were collected from secondary school teachers from both the public and private sectors of district Mardan, Khyber Pakhtunkhwa. The analysis of the collected data was carried out through Statistical Package for Social Sciences (SPSS) by applying percentage, mean, Standard Deviation and t-test. It was found out that public sectors SSTs have better beliefs and instructional competence of ICT use in teaching than private sector SSTs. It was found that female secondary school teachers have positive belief of ICT use in teaching than male secondary school teachers. Gender differences showed that male secondary school teachers have better instructional competence than female secondary school teachers. It is recommended that secondary school teachers of public and private sectors may be provided awareness about ICT use in teaching through seminars and workshops. Likewise, make sure provision of ICT facilities in secondary schools. Last but not least, practical training of teachers regarding ICT use in teaching learning process at school level is an essential component for the encouraging results.

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LIST OF ABBREVIATION

CA	Curriculum And Assessment
CD-ROM	Compact Disc Read-Only Memory
CFT	Competency Framework for Teachers
CL	Collaborative Learning
COSN	Consortium for School Networking
CPD	Continuous Professional Development
DNC	Dutch National Center
DVD	Digital Video Disc
E-mail	Electronic Mail
etc.	And so Forth
Ho	Null Hypothesis
i.e.	That is
IC	Instructional Competence
ICT	Information and Communication Technology
ISTE	International Society for Technology in Education
ITEA	International Technology Education Association
JRC	Joint Research Centre
KCA	Knowledge Creation Approach
KDA	Knowledge Deepening Approach
KPK	Khyber Pakhtunkhwa
L3	Lifelong Learning
LCD	Liquid Crystal Display
LMS	Learning Management System
MOESTVT	Ministry Of Education, Science, Technology and Vocational Training
MSW	MS Word
NMC	New Media Consortium
OA	Organization and Administration
PA	Policy Awareness

PI	Policy Innovation
PLN	Professional Learning Network
PPT	PowerPoint Presentation
PU	Policy Understanding
SMS	Short Message Service
SST	Secondary School Teacher
TAG-Org	Talal Abu-Ghazaleh Organization
TEIs	Teacher Education Institutions
TLA	Technology Literacy Approach
TPACK	Technological Pedagogical and Content Knowledge
TPL	Teacher Professional Learning
UIS	Institute for Statistics
UNESCO	United Nations Education Scientific and Culture Organization

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DEDICATION

This thesis is dedicated to my family. For their endless love, encouragement, and support.

CHAPTER 1

INTRODUCTION

1.1 Background of the Study

Information and communication technology (ICT) is the most important part of the teaching and learning process in the present scenario of the technological world. To meet the challenges of the 21st century, it is necessary that our teachers must be competent and equip with ICT use of the modern world. The importance of ICT in the teaching learning process cannot be neglected in the present situation (Anup & Raj, 2014). Teachers, textbooks, and blackboard/whiteboards were the highly heavy apparatus of teaching and learning before the last two decades. In the current era the ICT covered all fields of life including schooling (Saravanakumar, 2018).

Bhattacharjee and Deb, (2016) explored that development of Technology has brought changes in every field of life such as forming, engineering, health, and education. Now the use of ICT entered school education due to its importance and easy applicability in classrooms and students' interest. It is a well-known process that it has great capacity to improve the teaching learning process everywhere and at every level. It enhances problem solving skills, motivation due to its interactive nature and creativity of individual. Researchers, educationists, and teachers believe that the quality of education can be improved through regular use of technology like the use of ICT in learning process at specific school level. The speedy evolution of ICT has brought amazing variation in the global world of the 21st century and un-natural stresses in the present society. ICT is taking place very rapidly in our education system and daily lives (Mynbayeva & et al, 2017). The development of ICT tools has changed the whole

scenario, now focus is on construction of knowledge rather than transfer of knowledge. Nowadays we are only focusing on how to use computers instead of how to teach students more efficiently. That is the reason we are failing to integrate technology in classrooms (Vangrieken et al, 2017). Gomez-Galan and et al, (2016) concluded that for the study that transformation of quality education and pedagogical training of teachers are essential for the development of teachers and ICT use in instruction. In schools the pre training of teachers is not sufficient for fulfilment of teachers need during teaching learning process. Continuous professional development (CPD) plays a very important role. It helps teachers to adapt to new ways and trends of instruction in the present global world. In this way we can transmit the 21st century skills to students (Tairab et al, 2016).

Belief is an abstract word; its nature is qualitative and subjective. It is the inner thinking level or an idea or perception of a person regarding something (Clark & Peterson, 1986; Calderhead, 1996). According to Lavigne, (2014) beliefs are the perception of individuals regarding someone/something. For example, teachers' beliefs regarding pedagogy consist of teacher planning, adaptation and implementation of specific techniques and strategies in the teaching learning process. Teachers' beliefs and willingness is an important factor for ICT integration in classroom. Only ICT tools availability cannot help in learning. A teacher knows better how much he/she can integrate technology in their teaching. Teachers' use of ICT and their belief are directly linked with each other (Scherer et al, 2018). The stronger the teachers' self-efficacy regarding technology use, the more the teachers will open to use ICT in classroom practices (Scherer et al, 2015).

ICT is an umbrella word that refers to any type of communication devices, for example computer, cell phone, internet, hardware and software, radio, television, tape recorder and satellite systems and so on. It also includes video conferencing and distance education. The word ICT is often spoken in a specific context like ICT in education, ICT in health care and ICT in libraries (Archer & et al, 2014; Chauhan, 2017).

ICT competency is the capability of individuals necessary for survival in a specific environment that helps in learning and practicing in this digital world (the new media consortium (NMC) Horizon Report, 2017). Tairab et al, (2016) observed that ICT competencies play pivotal role in ICT integration in classroom. So competent teachers can integrate ICT in the classroom. Through continuous professional development (CPD) of teachers we can achieve the goal of ICT integration in the education system. According to Scherer et al, (2015) there are two types of factors which influence ICT integration in the education system.

a. Intrinsic factors (IF)
b. Extrinsic factors (EF)

Intrinsic factors (IF) include teachers' competence and confidence, teachers' attitude, and willingness. Extrinsic factors (EF) consist of time, professional development, and technical support from administration including principal support, proper planning of government and school, insufficient funds, and organization culture (Scherer et al, 2015). McGraw & Davis, (2017) explored that the school environment and incentives for ICT use are helpful for the successful integration of ICT in classroom.

According to Kapur, D. (2021) Secondary education is reflected as the utmost essential phase of educational life of learners. If teachers guide and flourish them at this stage, to provide comprehensive base in different themes such as related to the subject of science, mathematics as well as in English language, then learner succeed in life. The students' futures perspective concerning learning is persuaded by secondary level. However, quality higher education is directly influenced by the environment/ context of secondary level (Hossain, 2015; Javed & et al, 2016). In Pakistani education system the secondary level comprises of classes from IX- X and this level of education is responsible to delivers skilled work force for the social and economic progress of the country. Secondary education (SE) in Pakistan has two main objectives:

1. To facilitate the country's social and economic growth through the production of skilled individuals in the country.
2. To guide and facilitate the learners to prepare themselves for higher study (National Education Policy NEP, 2009).

Quality education in a country is possible only due to the addition of new methods and learning styles in the educational process. The quality education of an individual is looked-for to fulfill the economic gap in advanced countries through enhancement of effective instruction (constitution of (1973) of Islamic Republic of Pakistan). Aslan and Zhu, (2017) stated that ICT is a catalyst for change in the field of schooling such as change in teaching methods and style, change in strategies and techniques during class and easy approach to available information all over the globe. But this available information needs to be transformed in the young generation through suitable methods. This transformation of knowledge without competent teachers seems difficult. So, ICT competency is very necessary for teachers. ICT competent teachers often integrate technology in the teaching learning process in the best way (Cakir and

Yildirim 2013; Sipila, 2014; Aslan & Zhu, 2017). In this digital communication era teachers as well as students have easy access to information resources. But only access is not sufficient for success.

According to Wang, (2019) teachers and students can take advantage from ICT in learning to fulfill the following three requirements:

1. Should make instructors aware of ICT use in the field of education.
2. Teachers' knowledge and skill improvement in using ICT.
3. Re-design and re-construct the curriculum and educational system

The above three requirements are most important for the application of ICT in schools. If teacher's beliefs are negative about the ICT use in classroom and they consider it as wastage of time during school hours or according to the second requirement they have no knowledge and skills of ICT integration in classroom, so how can we expect quality education from our teachers (Wang, 2019). For the improvement of quality education in the country it is necessary to enhance competencies of teachers and students such as critical thinking, life skills, decision making, situation handling, team working and affective communication. For this purpose, ICT integration in teaching learning process and teachers' competency are the utmost need of the present situation (Al-Rahmi et al, 2018). Ghavifekr and Rosdy, (2015) described the usefulness of ICT that it has not only changed the role of teachers as a facilitator from traditional teacher but has also provided many websites and software packages that can be applied in classroom instruction during learning. In developing countries like Pakistan, the transformation of ICT in the field of education is very slow process. Some teachers take more time to get technology competency in the field of education, however the frequent use of software packages in schools like to prepare presentation on power point, excel and MS word

can develop teacher's ICT competency and make possible its application in teaching learning process. These packages are sources of information and help for students and teachers. The application of ICT in classroom and future behavior of teachers towards technology (belief) is directly proportional to teachers' competency and attitude towards technology use. Because teachers' competency and belief towards technology can develop ICT application in education system (Chun-Mei & et, al, 2018; Japhet & Usman, 2018). Ahmed (2016) state that ICT in education is the utmost need of present global world. In Pakistan's scenario the social media brings a broadened outlook and potentials in ICT application in education system. It has been detected globally that social media is used in the education system on a large scale.

According to Owens, (2014) in Pakistan teachers use social networks (SMS, WhatsApp, and Face book) for communication and collaboration with parents and students as well as in classroom lessons. However, Owens illustrates that social media in the education system is very effective way of ICT integration in education system. Social networks are considered a very useful source for teachers' communication within classroom, school, and community (Owens, 2014).

Akhtar et, al. (2014) found great contrast regarding ICT technology usefulness and implementation in public and private sector of Khyber Pakhtunkhwa (KPK) at secondary level. It was also observed that either implementation is not possible due to lack of teacher professional learning, ICT competence of teachers, resources availability at school level in KPK and teachers' belief regarding ICT use in teaching. As seen in the study of Guerra and Wubbena, (2017) teachers' beliefs and classroom practices are interrelated. So, the researcher selected this area of secondary school teachers' beliefs and instructional competence in using ICT in teaching. The area of

ICT needs to be monitored by the school administration, principals, teachers, and students for the best results of the teaching learning process in secondary schools of the respective District. According to Khurshid et, al (2016) teachers who were not aware of ICT are not completely knowledgeable about ICT still they eager to use all the new technologies. The government should prepare suitable ICT facilitations in all areas equally so that everybody can approach and be attached to the new technology. If the government does not give suitable facilities training issues come along and then technical and pedagogical expertise will hinder the application of ICT use in instruction. Competent teachers are the need of the day. It is necessary to integrate technology in the present technological world. A huge variance exists among the public and private sectors (Akhtar & et, al. 2014). Since the government must make the difference to a lot lower extents between public and private sectors so public category will have to decrease curriculum overload and over emphasis on recalling and memorizing. Which will permit students and teachers to participate in quality educational activities.

1.2 Rationale of the Study

The world is becoming a global village. All types of knowledge and information are being changed into e-form such as the use of e-mailing, e-books, e-journaling, and e-communication for example Skype meetings, discussions, face book, twitter, and bugs (online learning) etc. The development of ICT has changed the lifestyle of every individual in our society. Especially, teachers being an individual influenced by this change of ICT. Integration of ICT and application of theory into practice became possible in schools through the incorporation of ICT tools in teaching learning process and administration too. It is the need of the hour for teachers to transform their competence and abilities to meet the teaching requirements of the 21st century. The importance of ICT use in instruction drew the attention of researcher towards this area.

The Government of Pakistan has developed the national professional standards for teacher education (NPSTE, 2009), where standard number 7 mentions that the teachers of the state should have effective communication and proficient use of ICT. Therefore, teachers should have the basic knowledge to use available resources of ICT such as artwork, videos, camera, projector, and computer in their classrooms during instruction.

The researcher herself lives in the rural areas of District Mardan, Khyber Pakhtunkhwa (KPK), Pakistan and have observed that the government of KPK provided computer laboratories to secondary schools for students but generally, SSTs lack competence to utilize those laboratories in teaching learning process and record keeping. Therefore, they are unable to transfer the knowledge, skills, and abilities to students to use computers. Therefore, the researcher wanted to assess secondary school teachers' beliefs about ICT use in teaching. Furthermore, the researcher aimed to check the availability of resources needed for the integration of technology in the teaching learning process. Keeping in view the importance of ICT uses in teaching and daily lives, the researcher motivated towards this area.

The researcher studied many literatures, about teachers' competence in using ICT in teaching at international and national level, however, she observed that there was lack of research about teachers' beliefs and competence for using ICT in Pakistani context, especially in remote areas of the country. Therefore, to fill the gap the researcher selected the topic, "Secondary School Teachers' beliefs and instructional competence in using ICT". Last but not the least, the importance of my study can also be observed in the National education policy (NEP, 2009) which emphasis on e-competency of teachers and communication skills at all levels due to the excessive usage of digital tools of ICT.

1.3 Statement of the Problem

The aim of the present study was to investigate the secondary school teachers' beliefs and instructional competence of ICT use.

The use of ICT has become a culture in each institution in the form of E-Banking, E-Ticketing, E-Governance, E-Transferring, E-learning, and telemedicine. Moreover, the adaptation of ICT in education activities during the pandemic outbreak played an effective role in meeting the gap of traditional learning activities (Chandio, 2020: Haider, et al., 2019).

The researcher selected the concept of ICT due to its importance in the global world of 21st century. The study was relevant to researchers' field of interest in this area of research. Working professionally and academically on the topic regarding the differences of SSTs beliefs and instructional competence in public and private sector were taken by the researcher.

Public and private sector and gender differences were also observed regarding beliefs and competence of ICT use. In addition, the researcher checked the availability of computer related facilities at secondary level schools.

1.4 Objectives of the Research Study

The following were the objectives of the research.

1. To assess Secondary School Teachers (SST)' beliefs about the use of computer Technology in teaching.
2. To determine secondary school teachers' instructional competence in using Information and Communication Technology (ICT).
3. To compare Secondary School Teachers' beliefs about use of ICT in teaching in public and private sector schools.

4. To compare public and private sector Secondary School Teachers' instructional competence in using information and communication technology in teaching.
5. To compare gender differences regarding instructional competence in using Information and communication technology in teaching.
6. To determine gender differences in Secondary School Teachers (SSTs)' beliefs about the use of computer Technology in teaching.
7. To explore the status of availability of computer related facilities in public and private sector schools.

1.5 Research Questions

R.Q no.1. What do Secondary School Teachers (SSTs) think about the use of computer technology in teaching?

R.Q no.2. What are Secondary School Teachers (SSTs) instructional competence in using ICT in teaching?

1.6 Hypotheses

H_{o1} There is no significant difference in the mean score of public and private sector secondary school teachers' (SSTs) belief regarding the use of computer technology in teaching.

H_{o2} There is no significant difference in the mean score of public and private sector secondary school teachers (SSTs) instructional competence in using information and communication technology in teaching.

$H_{o2.1}$ There is no significant difference in the mean score of public and private sector secondary school teachers (SSTs) instructional competence in

using information and communication technology in teaching in the context of technology literacy approach.

$H_{o2.2}$ There is no significant difference in the mean score of public and private sector secondary school teachers (SSTs) instructional competence in using information and communication technology in teaching in the context of policy awareness about ICT.

$H_{o2.3}$ There is no significant difference in the mean score of public and private sector secondary school teachers (SSTs) instructional competence in using information and communication technology in teaching in the context of basic knowledge of ICT.

$H_{o2.4}$ There is no significant difference in the mean score of public and private sector secondary school teachers (SSTs) instructional competence in using information and communication technology in teaching in the context of integration of technology.

$H_{o2.5}$ There is no significant difference in the mean score of public and private sector secondary school teachers (SSTs) instructional competence in using information and communication technology in teaching in the context of the use of basic tool of technology.

$H_{o2.6}$ There is no significant difference in the mean score of public and private sector secondary school teachers (SSTs) instructional competence in using information and communication technology in teaching in the context of standard classroom.

$H_{o2.7}$ There is no significant difference in the mean score of public and private sector secondary school teachers (SSTs) instructional competence in using information and communication technology in teaching in the context of digital literacy.

$H_{o2.8}$ There is no significant difference in the mean score of public and private sector secondary school teachers (SSTs) instructional competence in using information and communication technology in teaching in the context of knowledge deepening approach.

$H_{o2.9}$ There is no significant difference in the mean score of public and private sector secondary school teachers (SSTs) instructional competence in using information and communication technology in teaching in the context of policy understanding in ICT.

$H_{o2.10}$ There is no significant difference in the mean score of public and private sector secondary school teachers (SSTs) instructional competence in using information and communication technology in teaching in the context of knowledge application.

$H_{o2.11}$ There is no significant difference in the mean score of public and private sector secondary school teachers (SSTs) instructional competence in using information and communication technology in teaching in the context of complex problem solving.

$H_{o2.12}$ There is no significant difference in the mean score of public and private sector secondary school teachers (SSTs) instructional competence in using information and communication technology in teaching in the context of complex tools in ICT.

$H_{o2.13}$ There is no significant difference in the mean score of public and private sector secondary school teachers (SSTs) instructional competence in using information and communication technology in teaching in the context of collaborative groups.

$H_{o2.14}$ There is no significant difference in the mean score of public and private sector secondary school teachers (SSTs) instructional competence in using information and communication technology in teaching in the context of managing and guiding in ICT.

$H_{o2.15}$ There is no significant difference in the mean score of public and private sector secondary school teachers (SSTs) instructional competence in using information and communication technology in teaching regarding knowledge creation approach.

$H_{o2.16}$ There is no significant difference in the mean score of public and private sector secondary school teachers (SSTs) instructional competence in using information and communication technology in teaching in the context of policy innovation.

$H_{o2.17}$ There is no significant difference in the mean score of public and private sector secondary school teachers (SSTs) instructional competence in using information and communication technology in teaching in the context of knowledge society skills.

$H_{o2.18}$ There is no significant difference in the mean score of public and private sector secondary school teachers (SSTs) instructional competence in using information and communication technology in teaching in the context of self-management.

$H_{o2.19}$ There is no significant difference in the mean score of public and private sector secondary school teachers (SSTs) instructional competence in using information and communication technology in teaching in the context the use of pervasive tools of ICT.

$H_{o2.20}$ There is no significant difference in the mean score of public and private sector secondary school teachers (SSTs) instructional competence in using information and communication technology in teaching in the context of learning organization.

$H_{o2.21}$ There is no significant difference in the mean score of public and private sector secondary school teachers (SSTs) instructional competence in using information and communication technology in teaching in the context of teacher as model learner.

H_{o3} There is no significant difference in the mean score of male and female secondary school teachers (SSTs) instructional competence in using Information and communication technology.

H_{o4} There is no significant difference in the mean score of male and female secondary school teachers (SSTs) beliefs about using information and communication technology in teaching.

H_{o5} There is no significant difference in the mean score of the status of availability of computer related facilities in public and private sector secondary schools.

1.8 Theoretical Framework

The aim of the existing study was to evaluate SSTs beliefs and instructional competence against the theoretical framework of UNESCO (2011). Therefore, the researcher used United Nation Education Scientific and Culture Organization, ICT-competency standards (2011) for trainers (UNESCO) ICT- CFT as theoretical framework for the present study. UNESCO, (2011) developed competency framework for teachers regarding ICT competence. It is called the ICT competence framework for teachers UNESCO, (2011). UNESCO ICT- CFT are ICT standards for educators which were first published in (2008) and then revised in 2011. They are based on three approaches, namely:

i. Technology literacy (TLA)
ii. Knowledge deepening (KDA)
iii. Knowledge creation (KCA)

These approaches are crossing with six components of educational system. These components are as under:

a. Understanding ICT in education
b. Curriculum and assessment
c. Pedagogy
d. ICT
e. Organization and administration
f. Teacher professional learning

These components are also presented here in below figure- 1

THE UNESCO ICT COMPETENCY FRAMEWORK FOR TEACHERS			
	TECHNOLOGY LITERACY	KNOWLEDGE DEEPENING	KNOWLEDGE CREATION
UNDERSTANDING ICT IN EDUCATION	Policy awareness	Policy understanding	Policy innovation
CURRICULUM AND ASSESSMENT	Basic knowledge	Knowledge application	Knowledge society skills
PEDAGOGY	Integrate technology	Complex problem solving	Self management
ICT	Basic tools	Complex tools	Pervasive tools
ORGANIZATION AND ADMINISTRATION	Standard classroom	Collaborative groups	Learning organizations
TEACHER PROFESSIONAL LEARNING	Digital literacy	Manage and guide	Teacher as model learner

Figure 1. 1 The ICT Competency Framework for Teachers
Source: (UNESCO ICT-CFT, 2011)

The conceptual framework of the present study is described here in pictorial form in following diagram:

1.8.1 Conceptual Framework of the Study

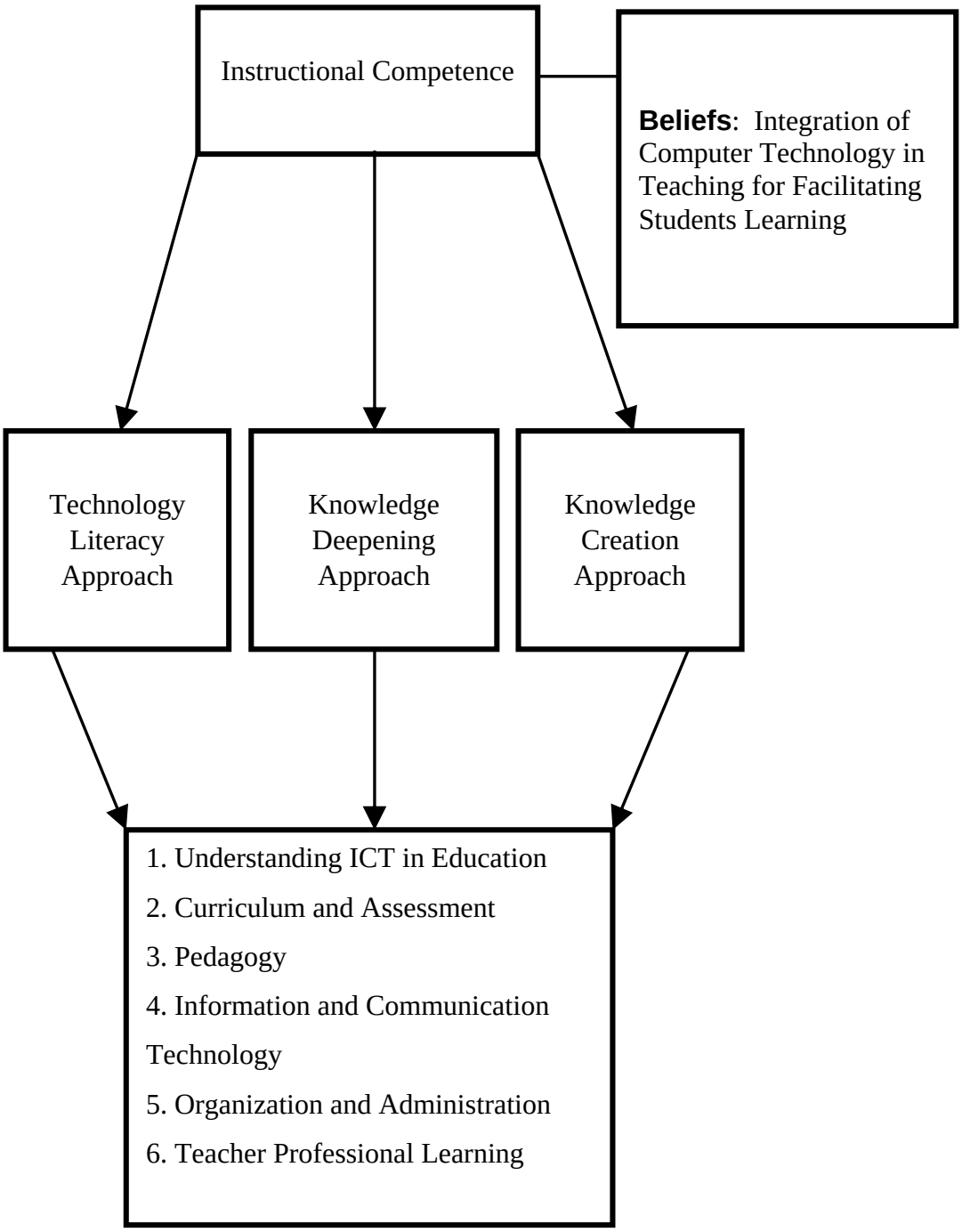


Figure 1. 2 ***Conceptual Framework of the Study***

Figure 1.1 depicted that the existing study identified the secondary school teachers' beliefs and instructional competence of ICT use in teaching. Beliefs and instructional competence were measured through three components of the UNESCO ICT-CFT, (2011). These components consisted of a Technology literacy approach, knowledge deepening approach and knowledge creation approach. Further these approaches were crossed with six components of educational system. As seen in figure number 1.2 (conceptual framework of the study). Moreover, each approach comprised of six subparts and there were three questions on each part related to the components of the educational system.

1.9 Significance of Study

Current study pays attention to the incorporation of ICT in education at school level which is unavoidable in the present scenario. The current study investigated the SSTs beliefs and instructional competence. As the secondary school teachers' beliefs and instructional competence of ICT use have not been presented together in literature. Many studies explored the importance of these variables with some other variable.

Current study is an excellent contribution in the field of secondary education in the context a backward area of Pakistan. In this area most of the studies have been done in a western context. Contextualization of present research variables at secondary school level is also of great importance. Because at this stage, teachers prepare students for different professions. Findings of the present study bridges the gap between teachers' beliefs about the importance of ICT in teaching and their competence in using ICT in teaching. These findings are also beneficial for the policy makers, curriculum developers, teacher trainer and professional development institutions of secondary school level.

It is expected that the outcomes of the present research project are helpful for schoolteachers, scholars, curriculum developers and policy makers by presenting a new paradigm for teachers' beliefs and instructional competence to enhance knowledge, skills, and abilities to survive in this technological world. The present research sets an example for future researchers to explore further in the same area.

1.10 Research Methodology

This section is comprised of research proposal, design, and population of the study, sample selection, technique of selection, questionnaire, and collection of data from respondents.

1.10.1 Research Design

Current study followed the quantitative research paradigm with survey design. As it was quantitative research so, the difference between two main variables were found out in public and private sector. Secondary school teachers' beliefs and instructional competence were the two main variables of the study.

1.10.2 Population of the Study

As for as population of the study is concerned all the SSTs serving in high schools of public and private sector located in district Mardan were the population of the study. According to the annual statistical report of government schools of Khyber Pakhtunkhwa (ASR, 2017-2018) there are total 167 public secondary schools (high) in district Mardan in which 87 are boys' secondary schools and 80 are girls' secondary schools. There are 2755 numbers of secondary school teachers (SSTs) in which 1526 are male while 1229 are female. Correspondingly, according to the annual statistical report of non-government schools of Khyber Pakhtunkhwa (ASR, 2017-2018), there are 130 private secondary schools in district Mardan. 3512 numbers of teachers are

there in which 2410 are male while 1090 are female SSTs. From the above statistics 297 are the total number of secondary public and private schools in district Mardan and secondary school teachers (SSTs) are 6267 in number. The population of the study were all SSTs teaching and guiding in the public and the private sector of the District Mardan.

1.10.3 Sample and Sampling Technique

There were two strata of the population. Male and female were the sub strata of the population.

1. Public secondary school teachers (SSTs)

2. Private secondary school teachers (SSTs).

According to Mills and Gay (2019) if the population size is around or above 1500 then sample size should be 20% of the population size. Therefore 20% sample size was taken from each stratum. According to (Ross, 2005) in proportionate stratified sampling technique, the sample is allocated in each stratum according to the ratio of population among the strata. Total SSTs of public sector were 2754 in which 20% were selected as a sample of the study which consisted of 550 SSTs. Total private sector teachers were 3552 in which 20% were selected for the study, which comprised 703 secondary school teachers. 1253 number of secondary school teachers were selected randomly from different high schools of district Mardan. A total of 550 (20%) of SSTs in public sector while 703(20%) number of SSTs from private sector were selected randomly. 1253 number of secondary school teachers were selected randomly. In these 1253 SSTs. 635 were male SSTs and 618 were female SSTs.

1.10.4 Research Instrument

Data was collected from the respondents of both public and private sectors SSTs with the help of an adapted questionnaire, which is based on the UNESCO ICT-CFT, (2011) framework for teachers. The adapted questionnaire consisted of three approaches; each approach has six sub parts. Each subpart has three questions of the educational system. Total questions of the questionnaire were 63 in number in which two were open ended questions.

1.10.5 Data Collection

Three sources like WhatsApp, email and post were used for data collection to faraway respondents while nearest respondents were visited personally by the researcher. Some of them demanded the Urdu version of the questionnaire which was provided. The researcher explained to respondent the purpose of the study and data collection.

1.10.6 Data Analysis

After collection of data, it was arranged properly and then evaluated statistically by means of Statistical package for social sciences (SPSS) by applying statistical tests like t. test, mean, percentage. In present research both descriptive and inferential statistics were applied. T-test was applied to test the hypothesis. Conclusions were drawn through statistical analysis of the data based on findings and recommendations were suggested accordingly.

1.11 Delimitation of the Study

The present study was delimited to following aspects due to time and other financial constraints:

1. Finding out the SSTs (male and female) belief and instructional competence about the use of ICT for teaching at secondary schools in public and private sector in District Mardan, KPK only.
2. Assessing SSTs beliefs and instructional competence using ICT as per UNESCO ICT-CFT, (2011) based adapted questionnaire.

Using questionnaire (attached as Appendix- A) for secondary school teachers (SSTs) data was collected.

1.12 Operational Definition

Operational classification of the research variables helps the reader to clearly understand the meaning of the terms used in the research study which the researcher aims to carry (Gay & et al., 2012). The following terms are operationally defined for the current research study.

1.12.1 Secondary Level Education

In the Pakistani education system, the secondary school level includes the 9^{th} and 10^{th} years of formal education.it is known as secondary school certificate (SSC). The classes are attended by students of 15 to 16 years of average age. Other names used for secondary education SSC are intermediate and secondary level. In present study secondary level schools means high and higher secondary schools of district Mardan. In which the 9^{th} and 10^{th} class students receive education for secondary school certificate (SSC) after completion of the specific duration.

1.12.2 Secondary School Teachers (SSTs)

In current study secondary school teachers means the teachers who teach to 9th and 10th class at secondary level. These teachers consisted of SST (general), SST (biochemistry) and SST (math/ physics).

1.12.3 Beliefs

In current research study the researcher means SSTs beliefs/ thinking or an idea about the importance and use of ICT in instruction. It consisted upon pedagogy, teacher planning, adaptation and implementation of specific technique and strategies during instruction.

1.12.4 Teachers' Instructional Competence

In the present study instructional competence of teachers denotes the capability (knowledge, skills, and attitude) of teachers (SSTs) regarding effectiveness, usage, and integration of ICT in instruction.

1.12.5 ICT

In present study ICT stands for Information and Communication Technology/ technologies which include computer laboratory facility, presence of computers, access to internet, mobile phone, availability of computer teacher, uninterrupted power supply (UPS) and technician and technical assistance, etc.

1.12.6 Technology Literacy Approach (TLA)

It is **t**he ability to search information through the internet by using ICT to communicate with students and teachers. In present study it is the use of computers and internet, use of social media in teaching. The purpose is to check teachers' beliefs and instructional competence through their views.

1.12.7 Knowledge Deepening Approach (KDA)

This approach in present study means the teachers should have mastery in using ICT resources in school and give value to use the knowledge to solve complex problems in daily life.

1.12.8 Knowledge Creation Approach (KCA)

This approach deals with that teacher should have the ability to create something, such as developing power point presentation or designing ICT incorporated lesson plans for students.

1.12.9 Policy awareness (PA)

In present study policy awareness means that SSTs have some idea about the policy and importance of ICT use in instruction.

1.12.10 Basic Knowledge (CA)

In present study basic knowledge means, SSTs have some competence to use ICT in instruction by using internet for lecture preparation and evaluation of students.

1.12.11 Integrate Technology (P)

In present study it means that SSTs have some skills to integrate technology in teaching by preparing lesson plan for students.

1.12.12 Basic Tools (ICT)

In present study Basic tools means SSTs have access and use basic ICT tools such as e-mail address, software for teaching, computer for maintaining students record.

1.12.13 Standard Classroom (OA)

In present study it means that SSTs should have some competence to use computer lab, organize classroom for individual learning and small group activities.

1.12.14 Digital Literacy (TPL)

In present study it means that SSTs have competence to use ICT for students and their own development and performance.

1.12.15 Policy Understanding (PU)

In present study it means that SSTs might understand the ICT policy and give it importance in teaching. Such as ICT could change the teaching practice in classroom.

1.12.16 Knowledge Application (CA)

In present study it means SSTs should apply the ICT tools in instruction for innovative ways of assessments and should know how to apply learnt knowledge to make students to understand the real-world problems.

1.12.17 Complex Problem Solving (P)

In present study it means SSTs have competence to use internet to design on-line material to support students and apply project-based learning.

1.12.18 Complex Tools (ICT)

In present study it means SSTs have competence to use open educational resources to communicate with students, for maintaining progress of the students.

1.12.19 Collaborative Groups (OA)

In present study it means SSTs have competence to organize computers within the class to support collaborative activities. Such as project work/teamwork.

1.12.20 Manage and Guide (TPL)

In present study it means SSTs have competence to share ICT resources and collaborate with ICT experts and to use open educational resources for professional learning and development.

1.12.21 Policy Innovation (PI)

In present study it means SSTs have competence to discuss the importance of ICT policy and suggest policy for school.

1.12.22 Knowledge Society Skills (CA)

In present study it means SSTs have competence to help students to improve their communication skills, sharing of information and to acquire problem solving skills.

1.12.23 Self -Management (P)

In present study it means SSTs have competence to help students in creating ICT based activities that engage students in problem solving.

1.12.24 Pervasive Tools (ICT)

In present study it means SSTs have competence to use on-line learning environment to support students. Such as media, and collaboration with other schools.

1.12.25 Learning Organizations (OA)

In present study it means SSTs have competence to organize the classroom as learning community and to use web to share and collaborate with other schools.

1.12.26 Teacher as Model Learner (TPL)

In present study it means SSTs have competence to play key role in introducing ICT policy in school, integrate technology in their own class, and to participate in educating teachers during service.

CHAPTER 2

REVIEW OF LITERATURE

This chapter encompasses a review of studies that were done in the context of research variables. An effort has been made to organize the literature for defining and explaining research variables, identifying methodologies in previous studies, highlighting the trends followed, presenting findings of the research done in these areas and limitations identified by previous work.

2.1 Introduction

Every individual grasp some beliefs in life regarding something, likewise teachers also hold beliefs about teaching, ICT integration and students' progress. According to Calderhead, (1996) belief is subjective in nature and creates vision and strength. Beliefs are the inner thinking of someone about something likewise teachers' belief about the use of ICT in instructional methods, classroom management and technology integration. According to Micheal, (2018) belief is the mental state or condition that influence the way in which, we see things around us. The acceptable belief of our mind remains in our mind, until some negative response is received. Attitude is the way a person expresses or applies their beliefs and values and is expressed through words or behavior. Attitude is directly proportional to behavior for which any action of somebody carries out in any environmental society. Due to our attitude people easily judge our personality. According to the report of JRC (Joint Research Centre) technical reports, (2012) that e- competency is a human right of every citizen to survive in this digital world. ICT has tremendous performance in the field of education. ICT presents a specific digital context to enhance teachers and students

learning. It also helps in activity-based learning (Mohammadi, 2015; Al-Rahmi et al, 2018).

Aslan & Zhu, (2017) explored that ICT can be used for change in the field of education such as change in teaching methods and strategies during instruction. As the world is becoming a global village. All types of information is available all over the world, this available information needs to be transformed in the young generation through competent teachers using suitable new teaching approaches. The transformation of knowledge without competent teachers seems difficult. So, ICT competency is very necessary for teachers.

Sahito and Vaisanen, (2017) described ICT competencies and skills for teachers and named it 7Es for teachers. These are as under:

1. Expertise in use of window programs
2. Proficiency in use of safety procedures
3. Skill in use of hardware gadgets
4. Knowledge to use of internet
5. Know-how to create accounts.
6. Proficiency in fixing of software.
7. Knowhow to use of software

Sahito and Vaisanen, concluded that teachers should have all the above expertise during the teaching learning process. ICT Competent teachers are the need of the present system of education. As ICT competency improves teaching theoretically and practically (Khan& Markauskaite, 2017).

Hasse, (2017), stated that the fast-running world of technology is making teachers to take appropriate decisions every day because of concerning how, when, and where to adopt technology in classroom. For this purpose, teachers need ICT literacy to use ICT in learning process. Hasse identified some key competencies for teachers. These are as follows:

1. Practical services in managing technology.
2. Aptitude to analyze fluctuations in involved relationship.
3. Competence to multifaceted ways
4. Skill to analyze long run work to handle professionally.

Hasse suggested that special attention should be provided in the above areas of ICT in pre- and in-service teachers' development programs. For the improvement of quality education in the country, it is necessary to enhance competence of teachers such as critical thinking, life skills, decision making, situation handling, team working and affective communication. For this purpose, ICT integration in teaching learning process and teachers' competence are the utmost need of the present situation (Al-Rahmi et al, 2018).

According Hogenbirk, (2019) there are four distinctive areas of competencies for teachers required for ICT application in education system. These are as under:

a. Thinking and learning skills
b. Societal skills
c. ICT skills
d. Life skills

Thinking and learning skills include learning to learn, critical thinking, problem solving skill, imagination and creativity skills required for teachers' competencies. Societal skills consist of communication skills, collaboration, accountability, and responsibility of the community members. ICT skills comprised of three types of literacy in the field of information, media, and technology. The combination of cultural awareness, citizenship, leadership, and self-regulation of the teachers are the different parameters of life skills. Hogenbirk, (2019) point out that if any school is interested in ICT integration in education/classroom, the school authority should emphasis on the above skills. Teachers are technological and well-prepared workers for the fast-moving world of the 21st century.

Ghavifekr and Rosdy, (2015) concluded that ICT impacts students learning as well as teachers learning and bind the classroom activities to daily routine. Teachers believe that ICT is used in instruction and students' performance has a positive relation with each other. Teachers who have positive thinking/belief regarding ICT can integrate better ICT in instruction. Teachers' positive attitude regarding ICT is a catalyst for the implementation of ICT integration in classroom (Ghavifekr & Rosdy, 2015).

Lawrence, (2015) revealed that ICT has become a significant foundation for the improvement and efficiency in every sector. In education the integration of ICT in teaching has prominent character. The government and non-government programs have been investing millions of dollars for the application of ICT in schools and universities (Lawrence, 2015). Through ICT integration the teachers as well as students can enhance their learning. The use of ICT in classrooms has got priority all over the world. ICT helps students to learn better than the traditional methods of teaching. For this purpose, the teachers must have the capability to equip for technology integration. Teachers

should also transfer their knowledge to students through the integration of ICT in instruction (Archer et al, 2014; Chauhan, 2017).

Chauhan, 2017 explored key competencies of successful ICT instructors, these are grouped in three main broad categories as under:

1- Pre-competencies (before starting the course).
2- Competencies needed during work (among different stages).
3- Capabilities after completing the course (after work).

ICT integration is the utilization and submission of ICT tools in the teaching process. Presently our students are familiar with technology, and they can learn more through the integration of technology. ICT is contributing a lot in instructional methods which can lead towards quality learning in classroom. Teachers can prepare students for living in the digital world. Therefore, teachers have the key role in students' success. Chauhan, stated that the incorporation of ICT in classroom means to make possible the use of ICT in all aspects of teaching particularly in objective formation, lesson planning as well as in assessment strategies. Students' practical use of computers in class can develop their skills and positive ways to use computers. It also helps with technology integration in the classroom. The status of ICT uses in teaching learning process and teachers' beliefs regarding the use of technology in instruction are linked directly with each other (Chauhan, 2017).

Instructional competence leads to special skills and abilities required for everyone to learn and process the knowledge in specific ICT environment (Ilomaki et al, 2016).

Application of ICT in classroom is possible in a dynamic, proactive, and suitable environment with competent teachers. In some school's technical staff were not

available, that was a vast issue equally for trainers and learners. It can affect the teaching learning process (Jamieson-Procter et al, 2013).

Tucker and Stronge, (2017) state that instructional competence of ICT use is very necessary for teachers. Without these competencies teachers cannot help their students in this technological era. Trust et al, (2016) state that professional learning networks (PLNs) like face book, Skype, WhatsApp, E-mail, Twitter, IMO, viber and messenger have positive impact on teacher professional development (TPD). TPD and instructional competence (IC) in teaching learning process are directly linked with each other (Trust et al, 2016). Karuppiah et al, (2019) state that instructional competency of teachers regarding ICT can create knowledge societies which facilitate students' lifelong learning (L3). Elabbar, (2017) explored that teachers were the core element of the education system. They construct, create, and describe new methods of learning. That is why they are the best source of knowledge for their students.

Richmond et al, (2020) further emphasized the commitment of mentor teachers (MTs) and teacher candidates (TCs) regarding the integration of ICT in classroom. Olmanson, (2018) observed traditional methodology could be inspired by ICT integration in classroom. Teachers' motivation is also an important factor. Incentives can help in teachers' motivation and willingness for the integration of ICT in instruction. Teachers work more effectively when they are under observation was also described (Ronfeldt et al, 2018). Liu and Phelps, (2019) observed that teachers' professional learning (TPL) programs regarding ICT integration are the policy levers for the development of teachers' instructional competencies in the 21st century. CPD exercise of teachers and an application of a new framework for ICT integration are two distinctive elements for teachers' instructional competence in using ICT in classroom (Onyema & Daniil, 2017).

According to Avdeevaa and et. al, (2016) Professional teachers needed certain instructional competencies which could be described as under:

1. Providing the latest information to teachers.
2. Equipping teachers with required instructional competencies.
3. Developing in teachers' positive attitude towards technology and honesty with profession.
4. Selecting, collecting, processing, analyzing and managing for the purpose of creating their own websites
5. Creating new methods of teaching and communicating with all stake holders of educational system (Nair, 2017; Avdeevaa & et. al, 2016).

Arafah and Johari, (2015) explored competencies that are required for Secondary School Teachers regarding instruction in their classrooms. These are as under:

1. Subject matter competence
2. Pedagogical competence
3. Curriculum competence
4. Technology competence

Khan et al, (2012) concluded that teacher's positive attitude towards ICT integration and the availability of physical facilities in schools are the foundational needs for successful ICT integration of in classroom. Mehmood and Bokhari, (2012) state that for successful ICT integration in classroom school principal support is very necessary.

According to Zahidi, (2013) it is the utmost duty of teachers to integrate the existing ICT apparatuses in the learning process. The application of ICT devices in

classroom makes possible the lesson enjoyable event and students feel no tediousness during learning as well as construct their behaviors enhance their knowledge through critical thinking and decision-making skills. ICT is used for keeping student's records, library record and administration purposes. It can also provide guidance for teachers in the teaching learning process.

Kaur and Singh (2018) studied the SSTs beliefs and attitude concerning the usage of ICT in classroom. It was exposed that secondary school teachers (SSTs) have strong positive attitude towards ICT use but found inadequate results in case of application in classroom. However, some key factors were identified for inadequate use of ICT. These are as under:

1. Incomplete availability of internet
2. Absence of modern infrastructure
3. Imperfect technical support
4. Deficiency of training
5. Shortage of time
6. Inflexible curriculum
7. Outdated methods of evaluation
8. Degree oriented education system
9. Teachers' competencies

Kaur and Singh point out that teachers 'training should be developed for fruitful results of ICT integration in classroom. No gender difference was found towards ICT integration.

In Hogenbirk (2016) discussed five factors /topics regarding ICT literacy in education. These are as under:

1. Self-responsibility of the teachers and students for learning plays important role to meet the challenges of the new school ICT policy.
2. The outdated curriculum and examination system delay the process of ICT application.
3. Learning materials, methods of instruction, subject, group and level should be clear for good results.
4. Teachers' training is also an important factor for implementation of ICT.
5. Students should value the new methods and new learning requirements.

Palagolla and Wickramarachchi, (2019) observed two major indicators for ICT technology integration in education system. These are as under:

1. The absence of ICT related training.
2. Poor English language proficiency of teachers.

It was further elaborated that by providing teachers with professional learning (TPL) in the above two major areas the education system can overcome the problem of ICT integration in teaching learning process (Palagolla & Wickramarachchi, 2019).

2.2 Approaches to Using Technology

2.2.1 UNESCO (ICT-CFT), (2011) and Its Status

UNESCO and their partners (Cisco, Intel, Microsoft and ISTE tried to identify teachers' competency that should be developed for an actual incorporation of ICT in education. As a result, a document was prepared under a title as United Nation Education Scientific and Culture Organization (UNESCO (ICT-CFT), (2011) was first published in 2008 and revised in 2011.According to the revised document of UNESCO (ICT-CFT- 2011) only competencies are not enough for teachers. The application and use of technology can bring changes in the teaching learning process. The teachers

should transfer their knowledge, skills, and abilities to their students. Teachers can help their students to solve their problems, become creative and to work in teams using ICT resources.

UNESCO ICT-CFT, (2011) has introduced three approaches that were used in the teaching learning process. These are as under:

1. Technology literacy (TLA)
2. Knowledge deepening (KDA)
3. Knowledge creation (KCA)

The above three approaches were crossed with six components of the educational system which were discussed later in detail. These approaches are a part of continuum presented in developing stage wise. For example, to recognize the ICT use in teaching, what teachers will do at specific level of each approach. Knowledge about ICT practice in instruction and required skills were pointed out for teachers, are given in this framework. Separately every approach consists of different applications in education transformations and developments. For each approach there are suggestions of modern technology, teachers' role, and strategies essential for the application in classroom during learning. The effective integration of ICT technology in education depends upon only on instructors' ability to use technology with new methods. The diagram (1.0.1 page 17, chapter 1) depicts the United Nation, Education, Scientific and Culture Organization (UNESCO (ICT-CFT), 2011).

2.3 Components of Education System and ICT

Components of education system which were crossed with Technology approaches for teachers which help in education structure are as under:

1. To understand ICT in education system

2. To recognize the position of ICT in curriculum and assessment process
3. The addition of new strategies in pedagogy.
4. To know ICT in depth.
5. The usage of organization and administration through latest policies.
6. Teacher professional learning to update the teachers from the coming needs of the technological era.

2.3.1 Understanding ICT in Education:

ICT is considered the most powerful tool for transferring knowledge. ICT is two different sides of one coin. ICT has changed the teaching style from traditional method to modern method of teaching in which the learner is central and the teacher is only a facilitator. ICT introduced a verity of new methods for teaching through ICT tools in the teaching learning process. ICT use in classroom will bring dramatic changes in teaching learning process (Anup & Raj, 2014).

M.O. Egea, (2014) described the importance of ICT in the education system. The researcher suggested that the application of ICT in classroom can enhance students thinking skills, which can develop creativity and higher order thinking skills in a unique learning environment. The ICT implementation in educational institutions needs internal and external support from the school and community. However, M.O. Egea, (2014) further elaborated that Teacher professional development and availability of ICT related facilities can bring fruitful results. Teachers' technical support in schools and ICT infrastructure availability are the two important factors for ICT integration in education system (Ghavifekr & Rosdy, (2015). ICT has introduced the global village concept in which the people are in contact with each other like they are living next door to each other (Archer et al, 2014; Chauhan, 2017). The word ICT is used in a specific

context like ICT in education, ICT in health care and ICT in libraries, ICT in administration.

2.3.2 Curriculum and Assessment

Freeman and et. al, (2017) stated that assessment is an important factor in curriculum making process because it analyzes the environment carefully and further elaborates what techniques and strategies will be helpful in teaching learning process. Through ICT use in teaching process teacher can use special evaluation techniques that can be applied for students' performance, behavior, engagement, and decision making across class/section and school. According to Majid, (2020) assessment plays an important role in the process of teaching and learning. The need for a virtual learning environment is growing day by day. Due to the increasing demand for ICT use, assessment is made in a new and innovative manner. Grading of students, promotion, placement, and a suitable curriculum all are dependent on assessment. Majid further explored that an assessment serves a variety of purposes for all stake holders, administrators, policy makers, business leaders, community members and other establishments of higher education. Capano and Pavan, (2019) found that assessment and observation of the situation and surrounding environment can help in specific tool adaptation process for achieving specific educational objectives. Moreover, examination and analysis of the situation can point out areas which need improvement in the curriculum making process. Because curriculum is the pathway through which the educational objectives can be achieved (Freeman & et. al, 2017; Capano & Pavan, 2019). Marina, (2015) described that in present scenario, the use of ICT has reshaped the teaching process as it offers various tools that can be used in instruction to enhance

learning to a great extent. The utilization of ICT helps in assessment making process for students, delivery of assessment tasks, grading, and feedback to students.

2.3.3 Pedagogy

Word pedagogy derived from Greek which means the art of teaching. Word pedagogues in Greek denotes as teacher and paidagogos were slaves, responsible for pick and drop of children to their schools. These paidagogos also teach manners to school going children. That is why it got the name pedagogy. However, pedagogy is well-defined by way of:

Pedagogy is the method of teaching through which teachers transmit the knowledge of theory in a specific context of the educational system (Persaud, 2019).

According to Nicu, (2017) the latest and relevant knowledge of Pedagogy is very important for teachers, ICT use in instruction plays an important role in adopting new methods of instruction. Because pedagogy clarifies how teachers can transmit knowledge in an easy way. A deep understanding of subject matter is also necessary for teachers. ICT is used for this purpose to bring wonderful changes in this regard. Because every type of information is available on the internet (Nicu, 2017). Best Pedagogy and proficiency in relevant subjects are the two important elements for transformation of knowledge in the young generation. Competent teachers can help students in linking one idea to another. Presently the use of internet for educational purposes plays pivotal role in changing the role teachers as well as students (Harr, 2015).

2.3.4 ICT

ICT consist of the following three components:

1. Software

2. Application
3. System

Without the above three components the concept of ICT is incomplete (Chen et. al, 2015). ICT is two different sides of one coin. ICT has tremendous performance in the field of education. ICT presents a specific digital context to enhance teachers and students learning. It also helps in activity-based learning (Mohammadi, 2015; Al-Rahmi et al, 2018).

Mohammadi, (2015) stated that ICT includes any type of technology that can help to produce, store, and communicate information. ICT in education is used for the integration of different tools for transferring knowledge, skills, and experiences of learners. For this purpose, instructional competencies of teachers are very necessary for the improvement of ICT incorporation and association with the text in learning process.

Saravanakumar, (2018) explored that ICT is presenting significant changes in teaching methods. The pedagogy of the 21st century is totally different from the 20th century. The most observable changes in the education system are the penetration of ICT in the teaching learning process. The integration of technology has changed our ways of life, thinking, feelings, communication, and sociality (Mynbayeva & et. al, 2017).

Johnson, et. al, (2014) state that there are some basic requirements for teachers for the integration of ICT in instruction. These are as follows:

1. Management of information
2. Integration of information through ICT tools
3. Evaluation of the process
4. Creation of new methods for the process

Those are the abilities which are most important for working and surviving in a fluctuating worldwide civilization as well as for life-long learning of the 21-century world (Johnson, et. al, 2014, p. 19).

2.3.5 Organization and Administration

Sergiovanni et. al, (1980) defined administration as the art of managing people competently to achieve the organization goals.

Educational administration is the process of utilizing organization resources for the accomplishment of pre-arranged educational aims (Ali & Abdalla, 2017).

According to Chandio (2020) the adoption of innovative systems in education administration and management is the dire need of present scientific age. The use of ICT can restructure the education system through innovative methods in the teaching and learning process. Chandio further elaborate that the investment of ICT application in the school administration can also be appropriate to administer the resources (human and non-human) to accelerate service delivery, transparency, accountability and ensure the stakeholder participation effectively to achieve the organization goal. ICT can be used in three ways in educational administration:

1. To create access
2. To store data
3. To ensure the transmission and manipulation of information (Chandio, 2020).

As Bush and Glover, (2003) stated that educational administration is the process of planning and organizing the institution resources through technical skills to accomplish the organization goal. Educational administrators have the following two responsibilities:

1. Goal accomplishment
2. Retaining the school culture (Bush & Glover, 2003)

Hassan and Sajid (2013) observed that the confined utilization of ICT secured preferred and a significant status in the society due to lack of ICT infrastructure, lack of training, scarcity of experts, inefficient administration and planning flaws of education sector which create obstacles to ensure a successful implementation of ICT in education system.

2.3.6 Teacher Professional Learning

Mynbayeva et. al, (2017) state that two elements can change our present pedagogy to the 21st century skills. These are as follows:

1. We must change our ideology.
2. To adopt new trends in the educational system.

For achieving those purposes, our teachers are the key components of our educational system. They are responsible for the implementation of educational reforms. For this purpose, teacher professional learning (TPL) is important for the adaptation of new trends and technology in the field of education (Mynbayeva & et. al, (2017).

Liu and Phelps, (2019) observed that teachers' professional learning (TPL) programs are the policy levers for the development of teachers' competence and students' achievement. Teachers' professional learning (TPL), teachers's attitude, beliefs and awareness about technology are bringing hindrances and difficulties in the process of ICT use in teaching process (Nistor, 2014; Marangunic & Granic, 2015; Scherer et al, 2019).

According to the department of education & training Melbourne (2005) teacher professional learning (TPL) will be effective if followed by the 7 key points. These are as under:

1. Focused on and embedded in teacher practice.
2. Focused on Student learning outcomes.
3. Collaboration, reflection, and feedback
4. Evidence based work, guide the worker to improve and measure the impacts.
5. Ongoing, maintained and entirely combined with the culture.
6. Individual and group responsibility of the organization
7. To know about new research on current methodology

Gulbahar and Kalelioglu, (2015) observed that experience and high competencies are not considered becoming an effective teacher. Professional development is very necessary for teachers to become a role model for students in the teaching learning process (Adil et al, 2013).

The above six components will be part of each approach.

2.4 Technology Literacy Approach (TLA)

Technology literacy is the combination of four components these are as under:

1. Information Literacy
3. Media Literacy
4. Internet Literacy
5. Digital Literacy.

It is the ability to search for information through the internet by using ICT to communicate with others. According to Hasse, (2017) technology literacy is the competency to understand online information, to communicate online and to create

online material for students during teaching learning process. It is the ability to search for information through the internet by using ICT tools to communicate with others and to store it. According to UNESCO ICT-CFT, (2011) technology literacy approach comprised of the following important parameter:

1. Policy awareness
2. Basic knowledge
3. Integrate technology
4. Basic tools
5. Standard classroom
6. Digital literacy

2.4.1 Policy Awareness

According to the NMC, the CoSN, (2017), Policy is a combination and guidelines, rules regulation and laws necessary for future planning and leadership of specific system. Awareness is the state of knowing when something observed and wants to tell others or already known.

Philomina and Amutha, (2016) state that ICT policy awareness is very necessary for teachers. ICT has become the most controlling tool in the education system for shifting the trend of teaching from traditional to interactive in the present situation. Education systems become more productive and innovative through the incorporation of ICT in instructional process (Amutha, 2020). Butler et al, (2018) observed effective changes in teachers' attitude of ICT integration by adapting new policy of ICT integration at school level. The revision and implementation of (UNESCO ICT-CFT, 2011) was recommended for fruitful results in children education.

2.4.2 Basic Knowledge

The basic information about ICT is the art to use, process and communicate information through basic technology tools like computers, Laptops, mobile phone, internet, e-mail, and professional learning networks (PLNs) (Watts app, twitter, IMO, Messenger) etc. (Ghavifeker & et. al, 2016). Process technology integration devices is the one aspect of teachers' competency during teaching learning process International Society of Teacher Education (ISTE, 2000).

2.4.3 Integrate Technology

Integration of technology in classroom means to make possible the use of ICT in all aspects of teaching specifically in objective formation, lesson planning as well as in assessment strategies. Students' practical use of computers in class can develop their skills and positive ways to use computers. It also helps in technology integration in classroom (Chauhan, 2017). ICT itself is of no use, its utilization gives it value in the teaching learning process. Technology integration in curriculum is impossible without competent teachers (Archer et al, 2014; Chauhan, 2017). The ignorance of ICT integration in classroom, teachers' attitude towards technology and awareness of technology use brings hindrances and difficulties in the process of addition of ICT in teaching process in schools (Nistor, 2014; Marangunić & Granić, 2015). Scherer et al, (2019) states that teachers' beliefs about ICT and presence of computers are not the basic requirements for technology integration but it needs to relate the three components of knowledge such as know-how of new techniques, pedagogics and content information, as shown in (TPACK) model of Koehler and Mishra 2006. It is the art of teachers how they successfully integrate ICT in teaching learning process.

2.4.4 Basic Tools

Basic technology tools are consisting of computer, Laptops, photocopy machine, audio and video tools, cameras, printer, scanner, digital video disc (DVD) player, multimedia, projectors, and liquid crystal display (LCD) etc. (Ghavifeker et. al, 2016). Teachers' technology competency is the ability to enable individuals to apply ICT tools in instruction to accomplish, participate, gauge, and generate information in a fashion to move in a knowledge society and use of communication tools such as mobile, watts app and e-mail etc. These are the abilities which are most important for working and surviving in a shifting universal civilization as well as for better learning in 21 centuries (Johnson, et. al, (2014), p. 19).

Teachers' technology competencies regarding ICT consist of using different tools for transferring knowledge, skills, and experiences to learner. ICT in this regard includes any type of technology that can help to produce, store and communicate information. For this purpose, these competencies are very necessary for the improvement of communication skills in teaching learning process. According to Technology Standards of ICT for teachers' competencies have four major domains (International Standards for Teacher Education ISTE, 2014). ISTE Standards for Teachers are presented here in the following list.

1. Elementary know-how procedure of technology use
2. Individual and professional usage
3. Societal, moral and human problems
4. Technology usage and application in classroom (ISTE, 2014).

2.4.5 Standard Classroom

Standard classroom is the combination of furniture and other necessary artifacts (ICT tools) which help in the teaching learning process.

Chauhan, (2017) state that incorporation of ICT in classroom means to make possible the use of ICT apparatuses in all aspects of teaching particularly in objective formation, lesson planning as well as in assessment strategies. Students' practical use of computers in class can develop their skills and positive ways to use computers. It also helps in technology integration in classrooms (Chauhan, 2017).

Ghavifekr and Rosdy, (2015) analyzed the usefulness of ICT integration in classroom. ICT is very useful and can bring dramatic changes in the teaching learning process. The availability of facilities in classroom, teachers' beliefs, teachers' professional development and application of digital technology can enhance students' learning. ICT integration may be considered in future for management, policy making and planning. Suleman et, al. (2017) revealed that ICT well- furnished classrooms and conducive environment are the foundations for application of ICT in education.

2.4.6 Digital Literacy (DL)

According to International Technology Education Association (ITEA, 2000/2007). DL is the capability to understand, use, manage and assess technology. Digital literacy means the talent of an individual to search, assess, apply, share, and construct information through ICT technology and internet. (Cornell University 2020) Digital literacy the competency to use and understand information in various designs from different sources through computer (Paul Gilster, 2016).

According to the Library study skill support, (2020).

Digital literacy is a talent to survive, learn and efforts of individuals in a specific environment through internet, social media, and mobile phone.

According to Mid-Pacific ICT Center, (2014) report ICT education has four components:

1. ICT literacy
2. Resources and support
3. Use of ICT in business and industry
4. Research and development in ICT

ICT digital literacy and the availability of resources and support are the important components to be applied in education (Mid-Pacific ICT Center, 2014). Digital literacy is a multi-faceted concept having different areas. It is the talent to understand media, explore new information through the internet and communicate with others through technology. Digital competency is the capability of individuals necessary for the accomplishment of different tasks like problem solving, sharing information, creation, collaboration, and knowledge building in a specific environment (JRC (Joint Research Centre) technical reports, 2012).

2.5 Knowledge Deepening Approach (KDA)

Knowledge deepening approach requires from teachers that they should have mastery in using ICT resources in school and give value to use the knowledge to solve complex problems in daily life. According to UNESCO ICT-CFT, (2011) knowledge deepening approach is further based on following six parameters:

1. Policy understanding
2. Knowledge application

3. Complex problem solving
4. Complex tools
5. Collaborative groups
6. Manage and guide.

2.5.1 Policy Understanding (PU)

PU means the combination of spirits, desires and determination when combine with ICT instruments to accomplish the required objectives (Steunenberg, 2022). Palvia et, al (2015) observed that national ICT integration polices could provide basis, goals, and vision for education system about the integration of ICT challenges in teaching and how its application is possible in schooling process. These policies are useful for all stake holders of the education system and the general community.

Philomina and Amutha, (2016) described that ICT is a powerful element to change the traditional teaching methods into more productive and creative methodology. Which creates learning opportunities for teachers and students. ICT awareness is very necessary in this regard because the traditional methods and styles will not achieve the required goals of the 21st century. ICT centered methods of teaching can enhance the output of the education system. The policy makers, researchers and teachers should work together to achieve 21st century skills.

Jhonston, (2015) states that based on logic we cannot build effective policy. ICT will be very helpful to include residents in policy making process. In this way the government can take benefits from their ground analysis, personal opinions of local persons, knowledge, and capabilities of respective experts. Reflective knowledge of the environment and cooperation among the society members and stack holders are equally

important for policy creation and understanding (Gil-Garcia et. al, 2018; Longo & et. al, 2015).

2.5.2 Knowledge Application

When we use the available knowledge to make wise decisions through different ways and procedures. Procedures consist of rules, norms and different processes that lead us towards future behavior. Aslan and Zhu, (2016) state that there are some barriers that hinder the process of ICT application in the education system. These are teachers' ability to use ICT tools, nervousness to use computers in class and instructional knowledge. Aslan and Zhu, (2016) further elaborated that Teacher professional learning (TPL) can give fruitful results. Kampschulte and Eilert, (2016) state that three things are important for the application of ICT in tutoring schemes. These are as follows:

a. Awareness of teachers regarding ICT tools
b. Training to use ICT tools.
c. Implementation of ICT tools in instructions

UNESCO (2011) described that the pedagogy and process of ICT mixing in learning process goes through the following phases:

1. Developing
2. Spread over
3. Filling
4. Changing

Emerging is the first stage in which the teachers apply the ICT productivity tools in teaching learning process. Applying is a 2nd stage in which teachers enhance the

traditional teaching method through the integration of ICT tools. 3rd stage is infusing in which teacher link the subject area through blended learning environment. 4th stage is transforming in which teacher creates interactive environment through internet. Following the above stages teachers' need to be professionally equipped and aware of ICT integration tools in classroom (UNESCO, 2011).

Liu and Phelps, (2019) observed that teachers' professional learning (TPL) programs are the policy levers for the development of teachers' competencies and students' achievement.

2.5.3 Complex Problem Solving (CPS)

CPS is an ability of someone to solve unusual and inaccurate problems. CPS is a talent to observe the problem from different perspectives and find their alternative solutions and then select the best one among them (Dictionary, 2021d).

According to (Kreijns et al, 2013; Somekh, 2013) following are the 21st century services and art:

a. Active learning
b. Critical thinking
c. Problem solving
d. Communication skill
e. Information handling skill
f. Self-directed learning

Becker et al, (2017) described that continuous professional development (CPD) of teachers and ICT integration techniques are the best indicators for ICT integration in classroom.

2.5.4 Complex Tools

Complex means something having interconnected parts and multifaceted characters. Tool means instrument or apparatus that can help in performing work (Assar, 2015). So, according to Lim and Tay, (2003) ICT tools are classified into the following categories. These are as under:

1. Informative
2. Constructive
3. Communicative
4. Resignation devices
5. Collaborative tool

1. Informative tools consist of internet system, network virtual drive (NVD) and home page.
2. Constructive tools are MS Word (MSW), Power point (PPT), Adobe photo shop, front page and Lego etc.
3. Communicative tools consist of (e-mail) and (SMS).
4. The resignation device is compact disc read-only memory (CD-ROM).
5. Collaborative tool consists of discussion boards and forum etc.

2.5.5 Collaborative Groups

Collaborative learning (CL) is a new educational approach in which students make groups to enrich their learning. Group members work together in groups to complete tasks, solve their problems and explain/learn new educational concepts (Valamis, 2022). Trust et al, (2016) state that professional learning networks (PLNs) like face book, Skype, WhatsApp, E-mail, Twitter, IMO, viber and messenger are used for communication in groups. They have positive impact on teacher professional

development (TPD) collaboration in groups. Engagement in groups and ICT integration in the teaching learning process gives fruitful results.

2.5.6 Manage and Guide

According to the definition provided by Dictionary (2021b) the word manage is derived from Italian word manus (hand) & agree (to act upon). The combination becomes a word ‘’ maneggiare’’ which mean to handle something or specially to handle some type of tools with a degree of skill or horse etc.

Guide means to get the attention of someone by explaining its prose and cones in a situation or supervising and train a person in some difficult situation. Its full form is guidance which means understanding evidence, route, and teaching someone in a special incident of life (Dictionary, 2021b). In other words, we can say that guidance is the contribution of a person to someone to reach in an unfamiliar destination through special directions. According to the above discussion it is the duty of the instructor to manage the available ICT tools in school and make possible the application through guidance.

Lai, (2018) concluded that guidance and counseling improved students understanding in educational, vocational, and social perspectives. Guidance can develop the essential life skills in students such as life-threatening ability, creativity, and problem-solving skill. Ghavifekr & Wan Athirah, (2015) examined that without proper training and knowledge the teachers cannot guide their students in a proper way. TPL and ICT are directly linked with one another. ICT combination in coaching process need the availability of facilities in schools, teachers’ belief, and awareness about ICT.

2.6 Knowledge Creation Approach (KCA)

The knowledge creation approach deals with that teacher should have the ability to create something, such as developing power point presentation or designing lesson plans for students. ICT integration is the utilization and application of technological tools in the teaching process. These ICT tools help teachers to create something new and interesting for students. ICT is contributing a lot in instructional methods which can lead quality learning in in the global world of 21st century (Takwale & et. al, 2014; Jamieson-Procter et al, 2013). According to UNESCO ICT-CFT, (2011) knowledge creation approach is further based on the following six parameters:

1. Policy innovation
2. Knowledge society skills
3. Self-management
4. Pervasive tools
5. Learning organization
6. Teacher as model learner

2.6.1 Policy Innovation

Policy refers to a set of thoughts and principles or blueprint to be applied in a particular environment and accepted by an organization or state (Dictionary, 2021c). Innovation means introducing new ideas and methods for doing something. Policy innovation means to produce such a plane that helps in using ICT in the education system.

Philomina and Amutha, (2016) observed that the new national education policies have changed the teachers' perception about ICT and positively influenced the amalgamation of latest skills in educational process.

2.6.2 Knowledge Society Skills

As per the meaning suggested on Encyclopedia (2022) the word knowledge society is used as a metaphor (symbol) not as a clear concept. It means this is an umbrella word that examines many concepts and topics. Knowledge society is a strategy that helps in production, transmission, and application of knowledge. Skill is the ability to produce, transfer and apply knowledge. For example, ICT skills have different perspectives. It is used as an entertaining method as well as it gives uncountable ways of transferring and application of knowledge to the young ones and a better future of the entire world.

According to Trust et al, (2016) professional learning networks (PLNs) are supported using the following steps:

a. Face book
b. Skype
c. What Sapp
d. E-mail
e. Twitter
f. IMO

The above are the learning society skills used for communication through internet (Trust et al, 2016). Teachers' professional learning (TPL) can develop teacher's competence regarding ICT at three levels like ICT literacy, networking, and creation. Through these skills teachers can create knowledge societies which facilitate students' lifelong learning (L3) (Karuppiah et al, 2019).

2.6.3 Self- Management

Self-management is a special tool which helps someone to achieve goals, to manage time and organize life. It also helps in avoiding stress and increasing strength and motivation level for more opportunities (JGDB, 2020).

Goleman et, al. (2002) described six characters of self-management. These are as follows:

1. Self-discipline
2. Transparency
3. Adaptableness
4. Success
5. Creativity
6. Confidence

Kelleys, (1998) state that some elements are necessary for self-management. These are as under:

1. Be committed.
2. Value your work
3. Improve your skills to manage time.
4. Build your network for teamwork.
5. Accept change with time.

2.6.4 Pervasive Tools

Pervasive means present everywhere or common and unwanted physical effect of something that spread widely. For example, the internet spreads information all over

the world. Tool means instrument that helps the users in spreading information (Dictionary, 2020a).

In the light of the above ICT tools have the tendency to spread information all over the world if we desire or not changes are being placed.

2.6.5 Learning Organization

Learning organizations are specific environments where individuals consistently increased their building capacity to create and enhanced their thinking level and work collectively to achieve the organization goals (Dalto, 2019). According to Watkins and Marsick, (1992) in learning organization the members are involved in the process of development through collaboration and teamwork towards success. Elstad and Christophersen, (2017) argue that ICT integration in technology rich classroom is possible due to teachers' beliefs and self-efficacy of technology integration. Absence of proper training can create hindrances in technology integration and negative perception in using ICT in teaching learning process. Teacher education institutions (TEIs) are responsible for future planning and professional development (Ministry of education Oslo, Norway, 2014).

Ngeze, (2017) concluded that in Tanzania mostly teachers have laptops or smart phones. This is the evidence that teachers are ready to use ICT tools for training and learning process and other personal uses but the MoESTVT in Tanzania having no framework for the practical application of ICT usage in educational institutions. Patahuddin and et. al. (2016) observed that proper planning is necessary before using ICT tools in education systems. Planning and special support at different stages can enhance the level of ICT integration in classroom. Kirikçilar and Yildiz, (2018) found that teachers' high qualification can bring fruitful results in ICT integration. Mohebi

and Helder, (2019) found that mostly teachers of United Arab Emirates (UAE) have knowledge about ICT but due to poor implementation and practical experience in education system is seeing difficult.

2.6.6 Teacher as Model Learner

A model teacher is a special personality that inspires and encourage to struggle for success of learners, helps to reach the highest level of hierarchy and observe positive things in learners' personality (Gerstein, (2015). The world is changing at high speed due to technology. The things we learn today are becoming outdated. Learning is a special skill for teachers that remains for a long-time shape them as model learner. If a teacher thinks about this process, it develops an understanding to teach better than before. Teachers should be models (demonstrator) that students can enjoy their lesson and examine their processes of thoughts (Wale, 2018).

Teachers should be multi modeled due to new technology in the 21st century. ICT continuously impacts communication and exchanging information. Which describe the competency, instructional methods, learning activities, students' needs and assessment (Okeke & et. al, 2014).

ICT can help in retention of knowledge and learning achievement of teachers and students. ICT is used as a delivery system for teaching learning process. ICT tools directly change the process of learning through demonstration, for instance abstract concepts can easily be understand by images, pictures, different sounds, animation through cartoons and simulation etc. (report of UNESCO Institute for Statistics (UIS) and Talal Abu-Ghazaleh Organization (TAG-Org), 2016).

Bransford and et, al. (2000) summarized competencies (knowledge, skills, and abilities) of an effective teacher. Proficient teachers have a good understanding of their

respective area and disciplines. Which provide a roadmap for guidance in their assignments, to measure students' progress and prepare them for discussion during class. Skillful teachers have knowledge about students' conceptual hurdles that they face during learning. Expert teachers know how to handle every critical and non-critical situation of their students' hurdles. They can also integrate ICT in a way that the students enjoy every subject.

2.7 Instructional Competence

Instructional competence can be defined as:

Instructional competency is an approach in the process of teaching and the application of different models through different digital devices that enables us to adapt new methods of teaching and learning process (Krishnan & Hussin, 2017).

Instructional competence is the capability to use ICT in teaching methods. The teacher should have competence regarding new instructional methods and a positive attitude towards technology application in classroom for fruitful results (Gulbahar & Kalelioglu, 2015).

The IBSTPI has defined the competency of teachers like this it is an art of how to know about something, how to behave in a certain circumstance and in which manner the learned material can be transferred to offspring in a specific context. Instructional technology competency leads to special skills and abilities required for everyone to learn and process the knowledge in specific ICT environment (Ilomaki et al, 2016). Panigrahi, (2016) state that Instructional competency is a system of multifaceted movements of a person which comprising of knowledge skill and abilities necessary for the accomplishment of any task through the application of digital technology in an organization. Teachers should be ICT competent because of different roles in the global

world of 21st century. Teacher performs the role of leader and facilitator in digital classroom. Special training is required for teachers to facilitate students in technology-mediated environments. Learning is a lifelong process. Teacher ICT competency can be enhanced through continuous professional development (CPD) with the changing demands of the 21st century.

Instruction means to find out the way of doing something, like teaching in which the teachers find out different means of approaches, strategies, and instructional methods to transform the knowledge in the coming generation. It can be transmitted through different methods and strategies adopted by teachers, educators, and administrators. For achieving this purpose, the competency of the whole stakeholders is important for the transformation of all aspects of education in young ones. The competency includes three things like knowledge, skills, and ability of someone to renovate or change the behavior required for specific job like teachers need certain art and fun to transmit the information and knowledge in students and modify their behaviors also for bringing changes in the world through education (Pribeanu et al, 2017). Avdeevaa et al, (2016) have described the following Instructional competencies for teachers:

1. Selection and Collection of Information
2. Processing and Analyzing Information for Specific Purpose
3. Creating New Methods of Teaching
4. Management of Information by Creating their Own Websites
5. Communication with all Stake Holders of Educational System.

Teachers' technological competence regarding ICT consists of using different tools for transferring knowledge, skills and experiences to learner. ICT in this regard

includes any type of technology that can help to produce, store, and communicate information. For this purpose, these competencies are very necessary for the improvement of communication skills in the teaching learning process. According to Technology Standards of ICT, teachers' competencies have four major domains (ISTE, 2014).

a. Fundamental usage of technology
b. Private and proficient use of ICT
c. Public, principled, and hominoid matters
d. Skill of submission (ISTE, 2014).

There are some fundamental aspects of the technological competency of teachers to certify that to follow the latest technology in terms of educational and technical development of students and teachers. ICT competency consists of six aspects of competency (Gulbahar & Kalelioglu, 2015). These are as under:

1- To Know About the Culture.
2- Mechanical and Industrial Skills
3- Ordinary Assistances
4- Communicative and Communal Proficiencies
5- Direction and Development Abilities
6- Instruction Approaches Usage Aptitudes

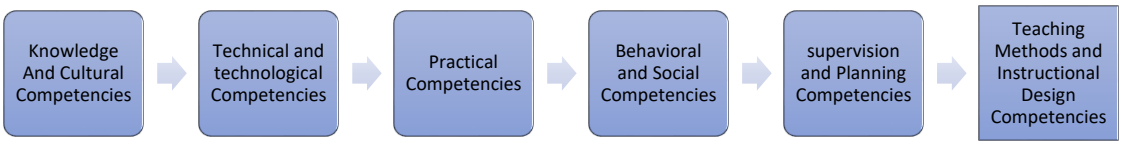


Figure 2. 1 The Instructional Competency skills of Instructors,
Source: (Gulbahar & Kalelioglu, 2015)

Competent Instructors have high quality of skills in terms of technology discovery and creation than the outmoded teachers. These talents and expertise are scientifically building the capabilities of technology instructors (Gulbahar & Kalelioglu, 2015).

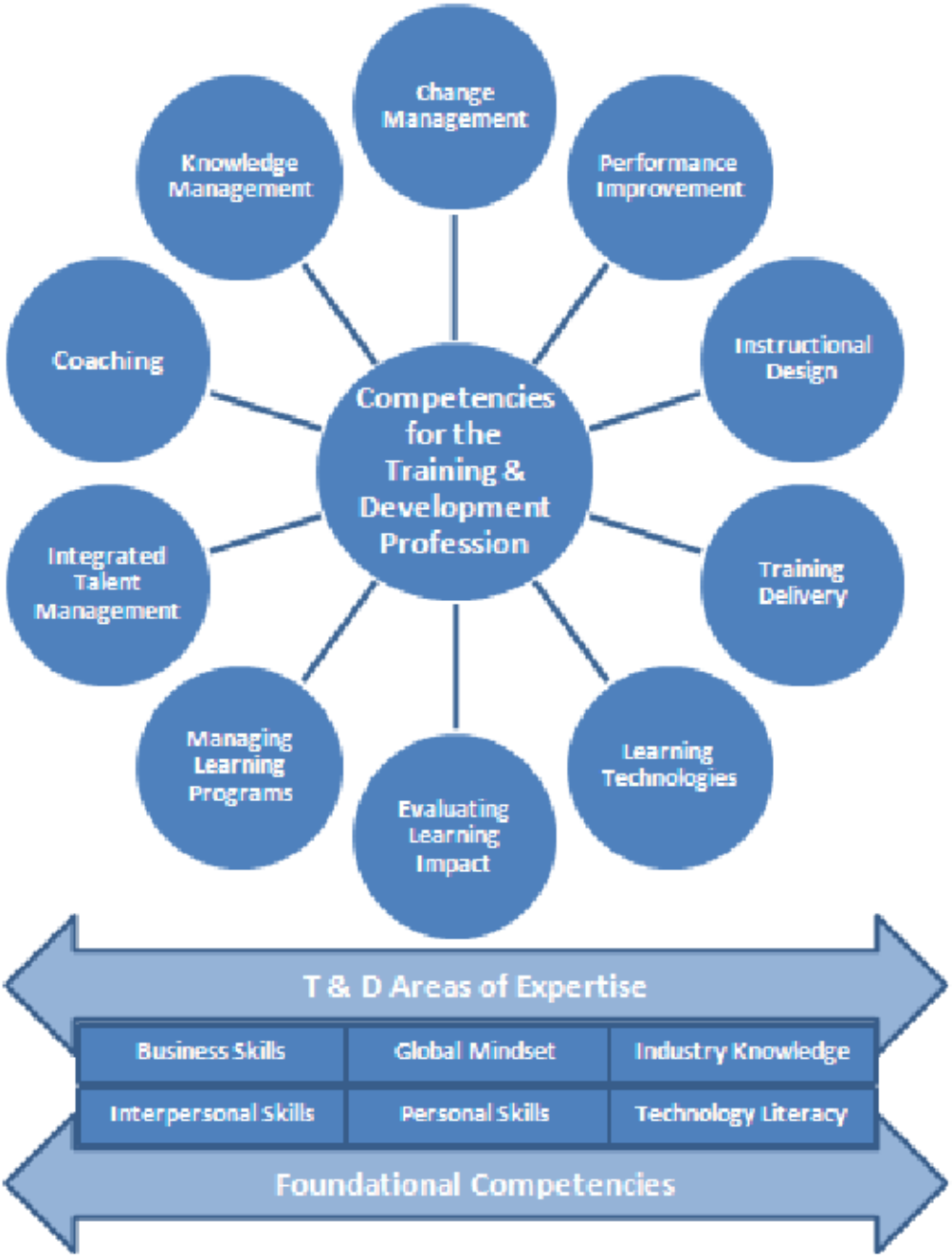


Figure 2. 2 ASTD Competencies for the Training & Development Profession, (2013)

According to ASTD, (2013) competencies are the capabilities consist of knowledge, skills and attitude that are essential for profession and professionals. Business skills are the abilities to analyses the requirements and find out solution of the problems and apply skills to get the required results. Global mindset is a universal belief

that is to accept cultural differences, respect, and awareness, the ability to accommodate others and accept diversity. Knowledge about industry means self-professional awareness and belief that can fallow the alteration tendencies and form bases of knowledge regarding industry. Interpersonal skills are to build trust among colleagues and talk effectively to inspire the participants, connect each other's and to determine the emotional intelligence. Personal skill is the ability to establish flexibility and perfect individual growth. Technology literacy is the awareness regarding technology and its effective use (ASTD, 2013).

ASTD, (2013) model sketches the hottest capabilities required for enhancing training and modification programs. The model may be used as a guideline for professional growth of specialists and leaders of the nation. This model highlights the following two types of competencies.

1- Foundational competencies
2- Role specific competencies

2.7.1 Foundational Competencies:

It consists of different types of skills such as business skill, a global mindset, and knowledge about industry, interactive skill, individual skills and technological mastery.

2.7.2 Role Specific Competencies:

It includes the proficiency in a specific area and management like routine enhancement, change, teaching methods, transfer of different types of trainings, learning technology, evaluation process, management of different types of programs, talent and coaching of knowledge and information.

2.7.3 Four in Balance Model

A Classical pictorial diagram for Genuine Expansion of ICT- rich education at School (four in balance model) was established by the exploration branch of Kennisnet, Th DNC of ICT in education system. This model is correspondingly observed the general development of ICT use everywhere (Kennisnet, 2015). The purpose of this model was to help schools to implement ICT in the teaching process. The foremost elements of the model/framework for the operation of ICT in school are as under:

1. School Vision (Institute dream)
2. Professional development of teachers'(PDT)
3. Digital content
4. Infrastructure(set-up)

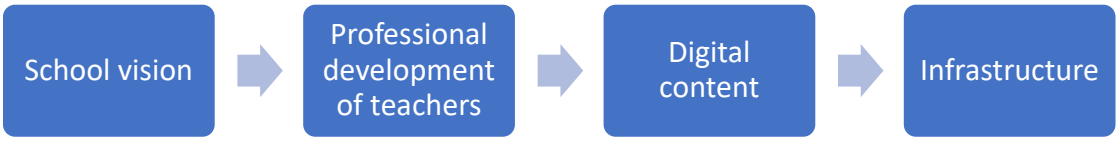


Figure 2. 3 Four in Balance Model (Kennisnet, 2015)

Hallucination and dream that (help to see the institution in which place) of the school is the foremost support of this perfect image. Vision emphasis on education in general and ICT supports this special vision for example, how is one's belief regarding the application of ICT in teaching and administrational purposes and how should we prepare them for further education through ICT application and future jobs? School vision is the starting point, and it will further expand in objectives for the perfection of education system regarding technology integration in classroom.

Teachers' professional development is the second element/pillar of this model. It means that the capabilities of teachers. Teachers may be clever to implement ICT in

their day-to-day lives and his/her own professional growth. School administration should provide support for the implementation of ICT. Supporting staff should be able to handle the new discoveries in the field of ICT and it should make possible its implementation in teaching learning process.

E- Educational contents (E.Ed.C) is the 3rd element of the model. It consists of different applications regarding subject, content available on the internet, simulations, different educational games, software, and digital context. The school should provide readiness license for software maintenance and instruction of teachers around the practice of ICT in instruction. Financial help and funding to use technology are also the school duty. ICT Infrastructure availability is the fourth element of the model. It is comprised of internet availability and connectivity, presence of hardware, devices accessibility like mobile phones, smart boards, and technical support to use ICT etc.

Kennisnet, 2015 concluded that the four foundational elements must be balanced for ICT application in school. For example, if a school has ICT facilities but the teachers are unable to use it, in this case the implementation will fail. Or the vision of school is providing perfect route for ICT application but there is lack of digital educational content such as software etc so how can expected the ICT usage in classroom. Kennisnet, 2015 further elaborated that school vision should be connected to teacher professional training then with other resources and requirements for fruitful results.

Richardson, 1996 stated in his book that teacher's competencies consist of cognitive and professional knowledge, professional beliefs, motivation and consistency

in behavior. As shown in the above diagram. It further includes knowledge of content, pedagogy and the art of transferring knowledge.

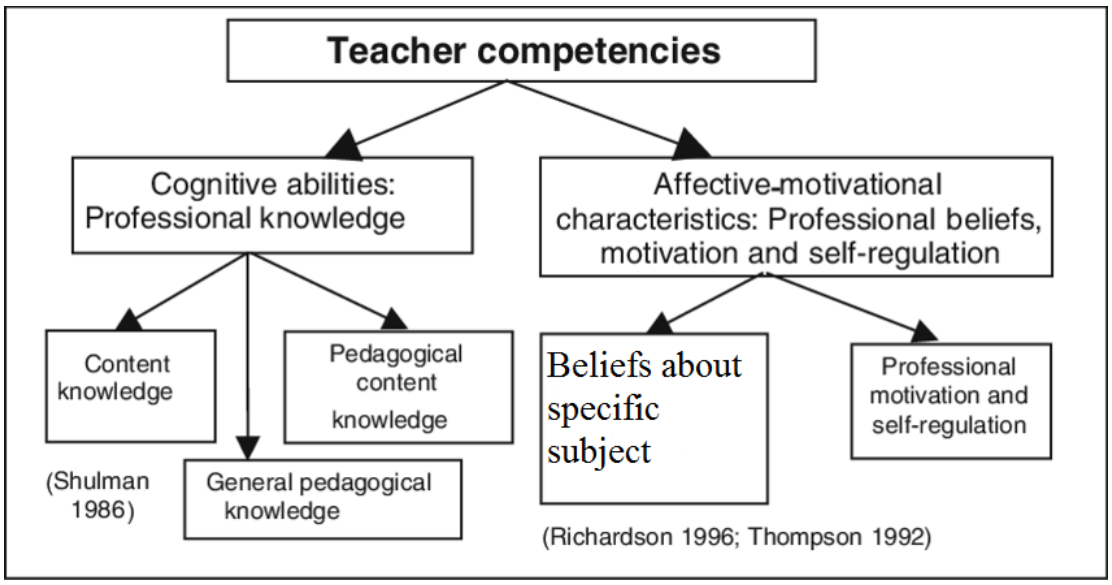


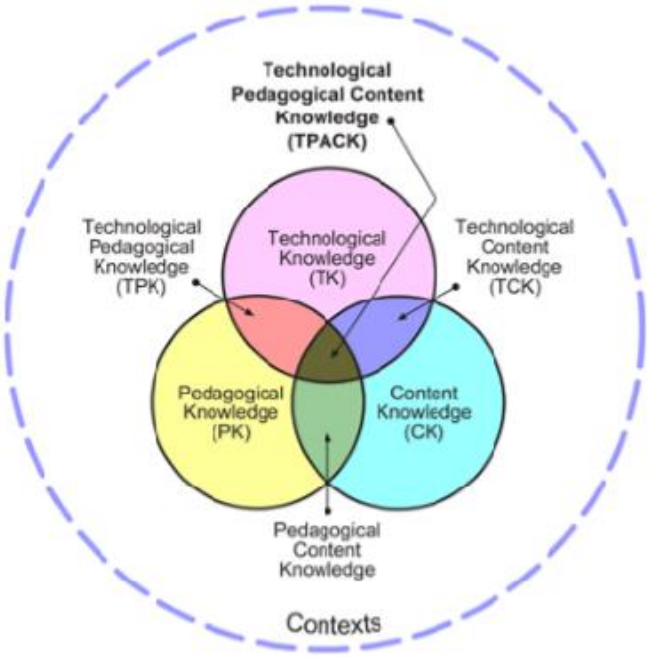
Figure 2. 4 Teacher Competencies (Richard 1996, Thompson 1992)

Teaching is a technical and complex task. Which require professional and competent teachers, broad and deep knowledge to instruct their students and transfer their knowledge, skills, and abilities through instructional methods it was time when digital technology tools were not offered than teachers were mainly focused transformation of knowledge and information instead of creation of knowledge. But the development of ICT tools has changed the whole scenario, now the focus is on construction of knowledge rather than transfer of knowledge (Takwale & et. al, 2014; Vangrieken et al, 2017). Teachers need to enhance their knowledge and skills to explore teaching competencies in the teaching learning process (Tucker & Stronge, 2017).

Smale-Jacobse and et, al. (2019) stated that individual differences exist everywhere. Teachers should have the competency to handle different types of students at different level during teaching learning process. However, Smale-Jacobse & et, al.

emphasis on continuous professional development (CPD) of teachers at secondary level to handle such type of problems.

According to (TPACK) model the computers habit to use in instructional methods by teachers are the hardware and word processing is the software used for integration of technology. Technology integration is not only the addition of computers in the teaching process but it needs to relate the three mechanisms of facts such as technology, pedagogy and content.



Koehler and Mishra (2008)

Figure 2. 5 Technological Pedagogical Content Knowledge (TPACK), Koehler and Mishra (2008)

Koehler and et.al, (2011) developed a guide for 21st century teachers. According to Koehler, teachers should be competent as described in the above design. The design consists of the following seven definitions:

a. Technology knowledge (TK)
b. Pedagogy knowledge (PK)
c. Content knowledge (CK)
d. Pedagogical content knowledge (PCK)
e. Technological content knowledge (TCK)
f. Technological pedagogical knowledge (TPK)
g. Technological pedagogical content knowledge (TPACK)

Tk indicates knowledge of low-tech to high-tech such as from pencil and paper to internet, interactive whiteboard, and software program. CK is the specific subject knowledge such as mathematics, English, Urdu, Science etc. that to be taught by teacher or learnt by students. PK denotes the process and teaching methods involved in students learning like management in classroom, lesson plan organization and assessment techniques. PCK is the mixture of three things pedagogy, content and learning objective to enhance students learning in classroom. TCK refers to the understanding of teachers to select suitable technology tool related to content that gave comparatively better results. TPK denotes how to be hand-picked and habit of technology gears to change the teaching method of instructor in classroom. TPACK discusses how the teacher integrate technology in specific area of subject matter to boost students learning (Koehler & et.al, 2011). Depew, (2015) applied TPACK framework to find out the capabilities of principals regarding application of technology in a k-12 public school. For fulfilling the aim of the study, the principal's proficiencies regarding technology and administration were compared. The findings revealed that a strong positive co-relation exists among TPACK elements and technology leadership abilities of principals. It was also observed that most principals are outmoded and have a lack of

new conceptions about technology, necessary pedagogy, and content. It was suggested that more emphasis should be given on knowledge building capacity of principals that make strong the relation of content, instructional methods, and technology usage, which indirectly enable the administrators to focus the ICT application during instruction instead of management. Karadenize and vatanartiran, (2013) explored that the TPACK is an excellent instrument for the evaluation of SSTs aptitudes and beliefs regarding technology, pedagogy, and content knowledge.

2.8 Teachers Technological Competence:

Teachers' technological competence is the information, skills, and capabilities to integrate ICT tools in teaching learning process (Foulger et al, 2017).

As need of the present situation the teacher should possess technological competencies. The future will demand from teachers' self- determination, self- paced learning, and highly tailored pedagogy for instruction to handle with technology competencies and demands of the technological era (Gulbahar & Kalelioglu, 2015). Wei and et, al (2016) found three important dimensions of Teachers' ICT acceptance and application in teaching learning process. These are as follows:

1. Smart instruction
2. Teacher professional learning (TPL) and guidance
3. Digital citizenship

The above three are significant interpreters of ICT acceptance and application for 21st century teachers. Wei & et, al further elaborated that there is strong positive correlation between ICT competency of teachers and application through School management system (SMS).

Razzak, (2014) observed that teachers are reluctant to use ICT in classroom, it may be due to their imperfect understanding and utilization of the concept of ICT and its integration in classroom. ICT related professional development programs (PDP) should be conducted in the respective area. PDP should consist of teachers' technological and pedagogical skills of ICT that increase awareness and offers exercises on the following three main mechanisms of ICT integration in classroom.

1. How to use ICT in teaching and students' learning?
2. How to teach through ICT integration?
3. How do students learn through ICT?

Razzak further elaborated that the above process should involve the school leaders because the teachers can expect from them to guide and set direction for ICT implementation. Resources availability for ICT integration, techno specialist and proper support should be provided with national or regional authority (Razzak, 2014).

Assar, (2015) described that there are three categories of ICT tools for teaching learning process. These are as under:

1. Digital learning material/ learning objects
2. General communication tools
3. Learning management system

Digital learning material includes video clips, graphics, photos, drawing, electronic circuits, and communicative resources for assessments (quiz and discussion). General communication tools consist of blogs, chat, and file sharing, wikis, social networks, and web conferencing. These tools help in communication during

pedagogical scenarios. The learning management system comprises of different software used for e-courses administration and delivery system. So, the teachers' technological competence in the above three areas can help in ICT integration in education system (Assar, 2015). According to Lawrence and Veena, (2012) the technological competence required for coaches for the application of ICT in teaching process.

Arranging and managing of different electronic files, to use folders and tables, transfer and reception of e-mail and forming necessary documents and graphs, accessing online resources, developing multimedia presentations, selection of instructional software for students' needs and record keeping etc. These all-technological competencies are categorized into five aspects. These are as under:

1. Productivity
2. Research
3. Communication
4. Media
5. Presentation

Their detail are as follows:

Productivity:

i) Production of learning documents and managing

The teacher should be able to receive parents' letters and can take care to send replies, can take prints for students needs and can manage students list and other necessary documents.

ii) **Analyze quantitative data**

The teacher should keep record of the students' test scores on spreadsheets and able to make digital tables and graphs for syllabus material.

iii) Establish info with the help of graphs

The teacher ought to be intelligent to arrange and use general tools like presentation programs and to make meaningful the educational information in class.

Research:

i) Use of effective online research strategies

The teacher should be able to use the appropriate research tools and select the best strategies for its application in class.

ii) Comparison of e-resources information

The teacher should be able to differentiate between authoritative untrustworthy sources and know how to transfer this skill to pupils.

iii) Excluding and site E-information and bases

The facilitator should be able to know different methods of book marking and saving that are presented to students during relevant lectures in class.

Communication:

i) Communication through digital devices

These tools consist of e-mailing, direct messaging, and cell colleagues. The teacher should be able to know in what way to shape and use these devices in the class during teaching.

ii) Connected teamwork for knowledge

The teacher should be able to take advantage of group work among colleagues, directing messaging, e-mailing, using wikis, chats, video and audio conferencing etc. that how to bring it in class and how to take advantages.

iii) Online Publishing of learning resources

The teacher should be able to post students' projects online to complex curriculum wikis.

Media:

i) Differentiate instruction with digital media

The teacher should be aware of assistive use of technology for disabled students and can produce innovative ideas for students during learning.

ii) Capturing of audio and video images

The teacher should have the ability to use digital cameras and can produce learning material for students such as slides showing of students' presentation in class.

iii) Educational multimedia experiences

The teacher should be able to combine multimedia with other sources to prepare useful and meaningful presentations for students and can transfer this skill in appropriate way.

Presentation:

i) Create presentation

The teacher should be able to prepare presentations on slid showing and relevant video playing following the rules of communication and can use these designs for digital work of students.

ii) Deliver presentations

The teacher should be able to use computers, projectors, and Light Emitting Diode (LED) etc. for presentation in class and should be able to transfer these skills to students.

iii) Application of all relevant tools of ICT

The teacher should be able to use smart boards, laptops, I-pads, projectors, cell phones and all types of internet resources for students' instruction in the class.

The above all are the basic skills for every teacher without any discrimination of subject and grade. The other needed competencies can be inducted through different types of training for teachers in the education system (Lawrence & Veena, 2012).

Arafah and Johari, (2015) explored competencies that are required for Secondary School Teachers in regarding instruction in their classroom. These are as under:

1- Subject matter competence
2- Pedagogical competence
3- Curriculum competence
4- Technology competence

2.9 Teachers ICT Competence

Teachers' competency is a set of facts, aids, experiences, beliefs, values, and passion needed for successful teaching at any level (Gupta, 1999). ICT itself is of no use, its utilization gives it value in the teaching learning process. Technology integration in curriculum is impossible without competent teachers. Nowadays we are only focusing on how to use computers instead of how to teach students more

efficiently. That is the reason we are failing to integrate technology in classrooms (Archer et al, 2014; Chauhan, 2017). In developing countries, the integration of technology in instruction undergoes many challenges. That is why it is important to determine how successfully can integrate this new technology in classrooms. It is recognized that ICT helps to participate in the 21st century by producing competent individuals and facilitate public mobilization (UNESCO, 2014). Takwale and et. al, (2014) observed that ICT has changed the teaching learning process. All the instructional methods have been taken place by new approaches like learner centered, discussion methods, critical thinking, creativity, co-operative learning, teamwork, and project method etc.

According to Panigrahi, (2016) new teaching techniques through integration of ICT are as follows:

1. Learner centered.
2. Questioning method
3. Innovative techniques
4. Co-operative and collaborative methods

In the above methods and teaching techniques it is expected from teachers that they perform the role of facilitator and mediator in different context of ICT environment which is known as network society. Panigrahi, (2016) further suggested specialized training for teachers to improve society, school and classroom with new skills and competencies of 21st century. ICT has brought changes in teachers' and students work and it can be applicable in all subjects. Integration of ICT in curriculum can be helpful

in lecture preparation, increased students' involvement in activities and shift the focus of teachers into students than content (Jamieson-Procter et al, 2013).

Fenwick and Edwards (2016) state that ICT is reshaping the training and duties of professionals. Quality education and proper CPD training of teachers can bring fruitful results. Karapakkam and et. al, (2018) highlight the importance of technology application in our system. ICT is very helpful in the teaching learning process. Various multifaceted problems and processes can be possible only due to the application of technology in education. Many abstract things can be explained and understood by pictures, images, and animated videos etc.

ICT proficiency is one aspect of teacher competency. Technological knowledge must attach with a variety of broad competencies. In this regard first technology standards for teachers were formed and focused, but these standards were ignored by training institutions. They followed a simple formula to satisfy higher authorities International Society for Teacher Education (ISTE, 2014). So, the owner of the training institutions found it very difficult to launch another curriculum/course for student-teachers. The International Society of Teacher Education (ISTE, 2000) presented technology standards for teachers and explain what the basics should be to know for competent teachers and what should be able to do by teachers. According to (NETS-T) are grouped in six categories (ISTE, 2000).

1- Philosophies and operation of technology clearance.
2- Preparation for favorable environment
3- Teaching and prospectus
4- Duty and estimation
5- Efficiency and proficiency

6- Common, moral problems

ICT has introduced the global village concept in which people are in contact with each other like they are living to the next door of each other. This is the reason mostly studies are conducted to find out the impact of ICT on society (tech factor, 04, 2010). The word ICT is often spoken in a specific context like ICT in education, ICT in health care and ICT in libraries etc. (Archer et al, 2014; Chauhan, 2017. According to the data of World Economic Forum Networked Readiness Index, Pakistan is in usage index of ICT on serial number 118 and on 123 on individual usage index (Dutta et al., 2015). Pakistan Telecommunication Authority (PTA) has reported that telephone density is 62.79 %, while due to mobile phone as ICT application device in classroom. The value of mobile phones has become lower up to 60.7 % (PTA, 2015).

Munir and khan, (2015), explored Pakistani teachers are using computers for personal use but failed in schools to integrate technology in classroom with curriculum. He further states that not only teachers are reluctant to use computers in classrooms but there are other factors which keep slow the process of teaching like teachers' beliefs, lack of facilities, confidence, and competence to use ICT technology in learning process.

Scherer et al, (2015) and Scherer et al, (2018) analyzed factors that create hindrances in ICT integration in teaching learning process. These are as follows:

1- There is no similarity in educational aims and ICT use.
2- Lack of training among teachers to use hardware and software provided in schools.
3- Curriculum is seen as difficult to integrate with ICT.

Existing of cultural norms gaps and difficulty of technological change in Asian civilization there are certain factors that affect teachers' instructional competence in integrating ICT in classroom. These are overloaded classrooms, lack of technological competencies, weak support of higher authority, rigid environment of schools, demotivated teachers, lack of co-ordination among staff, pressure to complete the syllabi and lack of mentoring etc. The results showed that mostly teachers use ICT for preparing notes and assessments for students but failed to provide constructivist classrooms for improving academic performance of students Scherer et al, 2015; Munir & khan, 2015; Alshammari et al, 2016).

Eickelmann and Vennemann, 2017 observed teachers 'superiorities, beliefs and views concerning the use of ICT in teaching process in the three European countries the Czech Republic, Germany, and Norway. It was explored for the first time that teachers' taxonomy (classification) of boldness and beliefs of ICT usage in teaching throughout the process are directly linked with computer use in schools. Furthermore, the following model was used in which the four elements were described and connected with the ICT use or technology adoption in classroom.

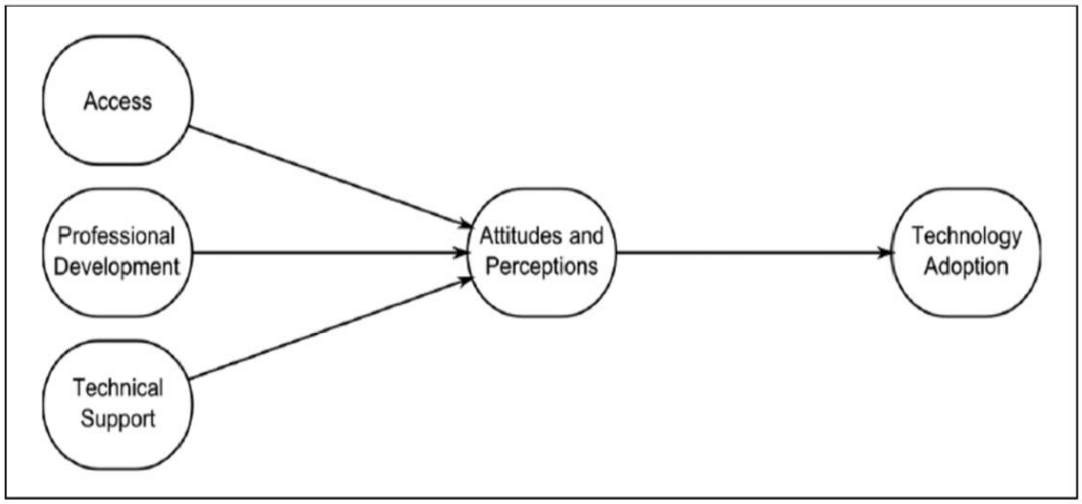


Figure 2. 6 Model of technology adoption by Rogers (1999), based on Velázquez (2006)

According to the Rogers, 1999 the elements of technology integration in teaching learning process are as under:

1. Access to ICT tools used in classroom instruction.
2. Teachers' professional development
3. Technical support from high ups and school principal
4. Teachers' attitude perception and beliefs about ICT use

Rogers concluded that the above elements are necessary for ICT adaptation in instructional methods used for learning process in schools.

Scherer et al, (2015) observed teachers who have strong belief towards ICT use, ICT integration in instruction and assessments techniques. Students are enthusiastic that their teachers should use ICT in instruction because they believe that it helps them in learning and memorization of course work. The students have queries about available resources in their schools and how teachers can use it in instructions? Students are requesting the facilitators to provide ICT devices and strong internet connection in their schools as well as in their classrooms. The major factors for teachers' integration of ICT are the readiness, approachability, and capability of teachers. These factors have a strong impact on teaching learning process.

The application of ICT and innovative methods make the teaching learning process interesting for students. A very small number of pupils are alike in the old traditional methods of teaching and mostly are in favor of innovative techniques. It is a known fact that computers can help in teaching through new methods, but nothing can replace teachers in the classroom (Vangrieken et al, 2017).

Chauhan, 2017 states that teaching software understanding and its application in instruction is very necessary for teachers during teaching learning process. It can replace teachers' weaknesses in specific areas that can help and standardize the teaching methods in specific school context and environment through integration of ICT.

Ghavifekr and Rosdy, (2015) analyzed the usefulness of ICT in classroom to support teachers in teaching process to replace the old methods of teaching. The intention of the research was to inspect teachers' beliefs of ICT addition in classroom for learning purpose. For data collection a survey questionnaire was used. 101 teachers from public secondary schools were taken as a sample. It was concluded that the use of ICT is very useful and can bring dramatic changes in the teaching learning process. It was also observed that availability of facilities, teachers' beliefs, teachers' professional development and application of digital technology in classroom can enhance students' learning. It was recommended that in future other aspects of ICT integration may be considered in management, policy making and planning.

2.10 Barriers of ICT Integration in Teaching Process

ICT integration is a complex process and one that may encounter a number of difficulties. These difficulties are known as barriers (Schoepp, 2005).

Classification of barriers:

Different categories have been used by researchers and educationist to classify barriers of ICT integration. Pine-Thomas, (2017) used the terminology of first- order and second-order barriers and Johnson et al., (2016) applied the terms external and internal barriers. Scherer et al, (2015) name them intrinsic and extrinsic factors. Intrinsic factors (IF) include teachers' competence and confidence, teachers' attitude, and willingness. Extrinsic factors (EF) consist of time, professional development, and

technical support from administration including principal support, proper planning of government and school, insufficient funds, and organization culture (Scherer et al, 2015). According to the above classification, Payal and Kanvaria, (2018), found in his study all the extrinsic factors. Such as computers deficiency in schools, internet problem, absence of computer assistant, teachers' competency regarding ICT. unavailability of teachers' mechanical provision, absence of ICT tools application, deficiency of available material for educators' help, lack of language proficiency, lack of Time, parents not in favor of ICT, pressure of exams and test, emphasis on theory rather than application of ICT.

Gulbahar and Kalelioglu, (2015) explored key competencies for ICT integration in classroom. Researcher state that with the introduction of the latest technology and discovery of new methods of teaching, learning is becoming more attractive all over the world. Therefore, for the transformation of skills and experiences of teachers, competent teachers are the key components for the application of ICT integration in classroom. Instructors must have a high level of technology literacy approach (TLA), knowledge deepening approach (KDA) and knowledge creation approach (KCA).

Karapakkam and et. al, (2018) described extrinsic factors like, time, resources, access, support, hardware failure, poor connection of internet, outdated software and one intrinsic factor that is teachers' competence and confidence.

Adil et al, (2013) observed that experience and high competence are not responsible for becoming an effective teacher. Professional development is very necessary for teachers to become a role model for students in the teaching learning process. Amuko and et, al. (2015) described that the teachers' subject knowledge, technological skills, and self-training in using ICT in teaching learning process are the

total capacity building foundation for teachers. It develops beliefs and passion for ICT integration in teaching. Schwartz, (2018) and Wang, (2019) observed that teachers' belief of ICT use in classroom, curriculum change, pedagogy, experience, resources availability, change in management, school environment, sufficient time, and technological competence are the important factors. Kihoza et al, (2016) find out the intrinsic and extrinsic factors, which hinder ICT integration in developing countries. Extrinsic factors included, lack of ICT tools & other resources, allocation of insufficient funds from Government. Government & school vision and policy, politicians' willingness, social & cultural values, corruption, time. Intrinsic factors consisted of teachers' beliefs & ICT integration, lack of e-competencies in teachers. In this research it was recommended that commitment is required from all the stake holders of the education system such as the Government, administration, teachers, students, parents, and community. As these all are interrelated and responsible for ICT application in classroom. The government should equip the schools with ICT related resources, because without these Resources ICT implementation is impossible. Proper planning is necessary which cover all Sectors of male and female schools. Special incentives should be provided to local software Companies to help teachers in providing program, software and skills related to teaching learning Process. Special attention is required to the professional development of teachers. Same findings and recommendations were suggested in the study of (Scherer et al, 2015).

Gil-Flores and et, al. (2017) described extrinsic factors that influence ICT use in classroom. For example, educational software, teachers ICT training, collaboration among teachers, perceived self-efficacy, teaching concepts. The presence of computer systems and internet facilities in institution as well as at home have less significant

effects on ICT use in classroom. It was suggested that educational policy should encourage the practice of ICT in classrooms. Alazam and et al, (2012) observed various factors which could affect ICT use in classroom. Those factors include teachers' beliefs, attitude, administration help, and provision of specific hardware and software program, computers availability, digital equipment availability, qualification of teachers and professional development, gender and age of teachers were the main factors.

Richmond et al, (2020) observed different factors of ICT integration in classroom. These are consisted upon, commitment of mentor teacher (MT) and teacher candidate (TC) who was responsible for ICT application in classroom, observation, practice, ICT tools availability. These all factors can successfully shape the teachers journey into teaching in ICT integrated teaching- learning environment.

Tallvid, (2014) concluded five different factors of teachers' reluctance to use ICT in teaching learning process. These are comprised of, technical competence, do not value the efforts, unavailability of facilities, poor management of time, incompetent administrative staff. These factors indicate the teachers' problems of ICT use in teaching. The teachers should have technical and administrative support, pedagogical knowledge, art, and skill to teach specific content. Through avoiding the above problems in the teaching learning process teacher can show best results. Tallvid, further elaborates that if teachers have better competence in management of the ICT tools and clearly see the learners' improvement in subject understanding. Then they did not show reluctance in ICT application in classroom.

Almarri and et. al, (2019) conducted a study on SSTs belief around the area of ICT usage in Saudi Arabia. It was concluded that secondary school teachers (SSTs) have positive beliefs about the ICT practice in instruction and learning process.

Karapakkam and et. al, (2018) specified that teacher's belief and attitude towards ICT are the basic foundational needs for technology integration in classroom. It was suggested that ICT integration needed continuous professional development (CPD) of teachers. Gopang, (2016) observed that mostly teachers have positive beliefs about ICT use in teaching learning process. It was observed that the availability of facilities hinders the process of practice of ICT in classroom during teaching. It was suggested that teacher professional learning (TPL) programs are necessary for teachers' instructional competence to join in technology usage in teaching learning process. Scherer and et, al. (2017) found positive attitude towards technology integration in education system. Derek, (2017) concluded positive attitude and belief about ICT use in teaching learning process but observed that teachers have no awareness and time to know about ICT tools in schools. Professional development training regarding ICT was also suggested. Imtiaz and Maarop, (2014) observed that teachers have an encouraging attitude to the application of ICT integration in classroom.

Ndibalema, (2014) described the SST attitude of ICT as educational means in Tanzania. It was revealed that secondary school teachers of Tanzania have constructive boldness of ICT as an academic instrument however ICT tools application in teaching seems difficult. It was also noted that teachers' unfamiliarity with ICT tools created problems in integration of technology.

Prospery Mwila, (2018) found positive attitude of teachers at secondary level in Kilimanjaro region of Tanzania. It was also found that both male and female teachers had strong beliefs of ICT integration in learning process. This was also informed that a strong relationship existed between age group and ICT integration belief. Lavigne,

(2014) state that teachers' belief regarding ICT use in teaching is the prediction and good sign of designing and application of new teaching strategies.

Shi and Li, (2015) observed teachers' belief regarding ICT integration in the teaching learning process. It was concluded that teachers who like constructivist pedagogy did not consider ICT as a powerful tool for teaching in classroom. Gender, age, area, and frequency did not affect the ICT use. They are not correlated with ICT belief. Promethean (2016) observed the beliefs of the educators regarding the ICT application in the teaching learning process. 55% of teachers thought that technology should be reflected in teaching because it is a necessary part of everyday life. 67 % of teachers believe that it is a best way to engage students. 62 % of teachers thought that technology can properly improve the learning of students as well as teachers.

Chow, (2015) find out teacher's attitude towards ICT integration in classroom. It was concluded that age has no effect on technology use. It was also noted that when teachers feel comfortable with ICT use the rate of ICT integration in classroom will be high. It was also revealed that the new technology, training, and instruction have little effect on teachers' perception. Chow suggested that technology should be taken advantage of, as a curriculum tool for integration in classroom during teaching learning process.

Kim et al. (2013) has a keen interest in finding out teachers' instructional belief and their relation to technology integration. In four years, experimental study found the significant co-relation between teachers' beliefs and technology integration. The researcher further explores those teachers having strong students-centered approach in teaching learning process, the more they used ICT in classroom. Butler et al, (2018)

observed effective changes in teachers' attitude of ICT adaptation by adjusting new policy of ICT incorporation at school level. The (UNESCO ICT-CFT, 2011) was recommended for fruitful results.

Guillen-Gamez and Mavorga- Femandez, (2020) found the lowest level of belief of ICT incorporation in education process. It is assumed that such an attitude may be due to their age, gender, participation in teamwork and fear of face-to-face meetings with the instructor.

Kaur, (2019) Found positive impact of Indian teachers towards ICT integration in teaching learning process but also identify some factors that create hindrances in ICT integration. These consisted upon. lack of ICT infrastructure, rigid timetable, fixed syllabus, technical support, continuous professional development, old methods of evaluation, diploma-based education, teacher less motivation level and competency.

Pall and Batra, (2016) observed that ICT plays an essential role in education system through the process of integration of technology in classroom activities. ICT is promoting critical thinking skill, creativity and confidence in both students and teachers. Pall & Batra further explain the importance of the barriers of ICT integration in classroom. Human and physical resources regarding ICT, continuous professional development (CPD) regarding ICT, Teachers' belief and skills of ICT application can help in ICT integration in education system.

Wentworth and Middleton, (2014) state that in the modern era of content-based technology teachers have also observed that the young generation can perform and use ICT better and in a more complicated way from their teachers since cell phones, laptops and other types of interrogational gadgets are an important part of students' life and the

students use all of these on daily basis. So, the students have become more committed and knowledgeable about the certain and basic uses of ICT. Computer positive beliefs is the confidence of coaches in usage of ICT in instructional process and assessments. Teachers' beliefs and brashness on the way to ICT routine can encourage other teachers and students (Kareem & D'souza, 2012).

2.11 Research on teachers' Beliefs and instructional competence

Marcial and Rama, (2015) examined ICT integration level of Philippines teachers. It was concluded that these teachers are at the knowledge deepening level of UNESCO ICT-CFT framework. Special attention is required for the development of ICT competency to use complex ICT tools for using innovative teaching strategies in teaching learning process.

Mahdum et. al, (2019) found out the awareness and motivation level of secondary school teachers regarding integration of ICT in schools of Indonesia. Data was collected through questionnaire from four rural districts of Indonesia. It was concluded that the gape of theory and practice is still exist in learning. It was recommended that improvement is needed in ICT integration in rural areas of Indonesia. Professional development of teachers (PDT) is very necessary for the ICT incorporation in lesson planning and delivering in classroom. It enhances teachers' proficiencies as well how to implement digital technology in classroom (Luft & Hewson, 2014; Tibyehabwa et al, 2017).

Wang, (2019) described subject core competencies of SSTs for the integration of ICT in classroom to fill the gap among theory, policy, and practice. Curriculum, textbooks, instructional methods, and assessment techniques were being modified but still

environment, methods of assessment and teachers' belief of curriculum change in the context of ICT were hindered the process of ICT integration in classroom.

Kihoza et al, (2016) conducted a study on ICT application school in Tanzania: prospects and encounters from the outlooks of TPACK and SAMR representations. The population of the study were tutors and teacher trainees from different training collages in Tanzania. They conclude that mostly trainees have low competencies regarding pedagogy. However, tutors have excellent knowledge regarding integration of ICT in classroom. The challenges faced by trainees in integration of ICT are mostly linked with the deficiencies of infrastructure, teachers' beliefs, and ICT competencies for the amalgamation of technology in laboratory. Kihoza et. al, (2016) recommended that government should work on special framework for ICT integration in classroom.

Abegail and Gonzales, (2018) conducted a study on Biology teachers' belief in Batangas city of Philippine. The researcher used (TPACK) model. Objectives of the study were biology teachers' belief and technology, pedagogy, and content knowledge for the year 2017-2018. Observation, group discussion and survey methods were used for data collection. The teachers were found with moderate self-efficacy belief. It was also found that teachers have no skill to use their technological, pedagogical, and content knowledge. As we know, teachers are the key component of the education system particularly for the application of new methods and curriculum in education. Proper observation, assessment and calculation are required in the field of teaching learning to achieve the required goals and objectives. Proper training was suggested for the application and enhancement of subjective and instructional techniques in the present technological world.

Ozdamli, (2017) found out the views of students (future teachers for special students) regarding integration of digital technology in the education system. Data was collected through interviews and questionnaires from 275 students at Near East University. It was initiated that student teachers have encouraging attitude in the direction of the application of ICT integration in classroom.

Papadakis, (2018) examines the age and gender of teachers regarding the mobile use in integration of ICT in classroom. TAM was applied as a framework for analyzation of data. 125 pre-service teachers were participants of the study, who were the students of one-year pedagogical program in Greece. However, (Papadakis, 2018) observed no differences in gender and age regarding the use of smart phones in the teaching learning process.

Ziphorah, (2013) explored the electronic policy of education department of South Africa that it is the demand of the higher authority that every individual will be ICT equipped till 2013.Though the implementation strategies for the application of policy did not describe yet. The reason is that mostly schools are not equipped with technology tools such as computers, internet availability, proper labs, projectors, Light Emitting Diode (LED) and uninterrupted power supply arrangements (UPS) that can help in teaching learning process. The second reason is that the educators are not fully competent to assimilate technology in curriculum. The study mostly explored the contests confronted through instructors and students regarding ICT tools availability and the application of ICT into curriculum. Ziphorah, (2013) suggested that the availability of ICT tools and teachers' competencies must be made sure for positive changes in the education system of South Africa.

Khan and et al, (2015) investigate teachers and students' use of ICT in day-to-day routine. They find diverse responses of students use and access to information. The study described that the students and teachers have contact with computers in schools as well as at home, they use it for different types of entertainment, communication, and education. The study also highlights the two opposite beliefs of students and teachers that teachers are agreeing to use ICT in class. The students do not agree on what technology they are using and for what purpose.

Aslam, (2013) observed that there were some factors which influence teaching learning process. These were as under:

1. Refresher courses
2. Workshops
3. Facility of education during service,
4. Motivation,
5. Guidance and counseling

Teachers' motivation is also an important factor. Incentives can help in teachers' motivation and willingness for the integration of ICT in education (Ravikumar, 2013).

Mehmood and Bokhari, (2012) examined the access of opportunity to use ICT in masculine and feminine schoolchildren. It was concluded that gender differences still existed. Unequal access to ICT uses in university was seen. It was recommended that equal access to ICT use may be possible due to providing ICT tools and other related information in educational institutions.

Munir and khan, (2015), examined perceives and combination of ICT at private intermediate level in Pakistan. Teachers' association with digital technology and its

integration in teaching learning process were studied. It was found that 75% of teachers were being trained for ICT use, 67 % teachers have access to technology and 53% teachers having the availability of internet facility at school as well as at home. It was seen that teachers were familiar from using e-mail, internet, and word processing. They use internet for searching material for lectures and paper preparation.

Chapelle, (2011) conducted a study on facilities availability in schools of Kenya. It was revealed that some schools have only one computer that is only for office use. Somewhere computers and students' ratio were unequal. However, ICT set-up in some schools were supported by the community. Computers have forced teachers and educators to be proficient in technology as it is one of the modern needs. It also compels them to use computer know-how in their schoolrooms. Many countries in the world have acknowledged the dire need of technological educated pedagogues and they hire such skillful teachers to meet the modern-day need. For this purpose, many countries have introduced training for their teachers to teach them technology. Moreover, they started some degree programs related to technology. The government of Turkey is worth mentioning here as it has introduced computer-based learning in schools. The higher education commission (HEC) has initiated some technology-based programs for teachers in order to equip them according to the modern-day need. However, many countries have come across some problems in implementing technological programs (Yüksel & Kavanoz, 2011).

Badau and Sakiyo, (2013) on the topic of "Assessment of ICT Teachers' Competence to Instrument the Innovative ICT based Syllabus in North-eastern Nigeria". The study examined the level of competency of the tutors of ICT of both rural and urban areas to implement a newly designed curriculum in the territory of

Northeastern Nigeria. The teachers were from secondary schools. The study basically focused on the six components of the teachers taking part in the study. The number of pedagogues who took part in the study were one thousand seven hundred and forty-four. These teachers participated in the study, from six different situations of Northeastern Nigeria. A closed-ended questionnaire was used in the study. The questionnaire consisted of eight different sections. The study used a descriptive survey design. Information was produced via questionnaires. The information was about the pedagogy, curriculum, policy, technology professional development as well as the hurdles of the teachers. Percentage, grand mean, and deviations were used in order to scrutinize the facts. According to the findings, the competence level of the pedagogues related to pedagogy, policy, ICT technology, curriculum, administration, and professional development is low. Moreover, the study also identified the hindrances that the teachers faced during the teaching learning process. The identified problems were the lack of hardware, software, electricity, information, experience of ICT application and financial resources. Furthermore, the study suggested that ICT needs to be made the part of development of teachers such as professional and the curriculum of the ICT should also be made capable of enhancing teachers' jobs performance.

Li Luen Ching, (2016) conducted a study and the title of the study was Capabilities of beginners' SSTs in utilizing communal ICT utensils and Office software letters and the suggestions for fruitful incorporation of technology devices in the Mauritian system of schooling. The research basically focused on determining the competence level of teachers such as trainees. The ICT tools as well as software were used to educate them. The data was collected quantitatively to show it in percentage. The study demonstrated that the participants of the study were dexterous in terms of using common office software. Moreover, the study also found that the competency

level of the teachers varied based on the task given to the participants. The sample of the study was 212 and the data was collected through questionnaires. Among the participants 69.5% were married. The participants were associated with three main programs such as bachelor's in education (B.Ed.), teachers' diploma and post graduate certificate of education. The designed questionnaire consisted of three pages, and they were test piloted. The first portion of the questionnaire was related to information, for instance objectives and purpose. The second part of the questionnaire was about focusing on office software related knowledge and the participants were supposed to respond to that. In part three of the questionnaire the participants were supposed to indicate their interaction and familiarity with computers. Furthermore, part four of the questionnaire was about the availability of technology-based resources in the participants' respective schools.

Kaźmierczak, (2017) conducted a study on the topic titled "Skills and Capabilities in the Knowledge Society". The study discussed the nature of knowledge society. The study demonstrated various classifications of a set of skills. The study also proposed a new one on a neuro-didactic concept. The study suggested some theoretical and practical solutions which are derived from neuro-didactics. Furthermore, the study suggested that learning management system (LMS) tools are the effective techniques and method which are essential for educational process.

Onuyi, (2021) conducted a study on "A calculation of ICT Fitness amongst teachers of federal unity colleges in northern Nigeria. The determination of the enquiry was to examine ICT competence level among the pedagogues of the Federal unity colleges. The teachers were from the FUC situated in North Central Geo-political zone. The study was basically survey research. The teachers of all (FUC) situated in North

zone were the population of the project work. Accidental sampling technique was used in the study. Four hundred teachers participated in the study among four hundred teachers fifty teachers were from each school. Among the participants, two hundred in ninety-eight (298) were males and one hundred and two (102) were females. Teachers from various disciplines took part in the study. These are: Sciences fifty-six (56), Arts one hundred and seven (107), social sciences one hundred and thirteen (113), languages one hundred and one (101), and Vocational and Technical twenty-three (23). The data was collected through ICT competence questionnaire. The outcomes of the study were discovered that most of the instructors were not able to use ICT in their instruction and their competence level were found as low. Furthermore, according to the findings of the study many of the teachers had their own personal computers or laptops but despite that they were not proficient in terms of using them. The internet facility was something arranged by the teachers themselves, which shows that the facility in the colleges was inadequate. The greater part of the participants rated their ICT performance as low. It shows that the targeted pedagogues were not thoroughly equipped in terms of using computer technology proficiently. Finally, it was revealed in the study that the biggest problem was associated with the money required for ICT training, workload, and making of facility available was something part of the teachers. The study suggested that the government needs to focus on the ICT training of teachers and the training should be made mandatory.

Arafah, (2015) conducted a study on "Competencies for the Classroom Instructional Designer" in which the competence of the secondary teachers is identified. The competence of the teachers for designing their classroom interaction has been focused throughout the study. The study used qualitative approach and it was conducted in Indonesia. The respondent in the study were eight (8) persons from South

Sulawesi province of Indonesia. Snowball sampling technique is used to get to the participants of the study.in order to keep the identity of the participants the researcher used coding for both the participants of the interviews and questionnaires. The thematic analysis of the data was done in five steps. These respondents were superintendents and teacher trainers from the various schools of South Sulawesi province of Indonesia. Semi-structure interviews were conducted to get the data. To get more information thematic analysis was used. Through thematic analysis the researcher was able to get detailed information via identifying, reporting, and analyzing more patterns required for the competences. According to the findings of the study the competences required are pedagogical competence, curriculum competence, subject matter competence and technological competence. According to the findings of the study the identifications of these competences are vital for school and college teachers to perform effective learning. These four competencies, according to the opinions of many of the respondents, will act as a set of knowledge bodies that will lead pedagogues to formulate a well-designed instruction. Moreover, the study suggested that these four competences may be utilized as focus in terms of designing classroom activates in order to meet the national and international objectives and needs.

Montrieux et al., (2015) directed a study on the topic Teaching and learning with mobile technology: A qualitative explorative study about the introduction of Tablet devices in secondary education. In the study the researchers investigated the insights of tutors and pupils related to the usage of new technology to teach and learn in the classroom. The study was an explorative focused group one in which eighteen (18) teachers and thirty-nine (39) students took part. A focused group qualitative study was carried out in the institute of Flanders which comes in the Dutch speaking region. During the year 2012 the students and teachers got their personal tablets which could

be used both in their homes and school. The focused group was the one who had been using tablets devices since 2012 in a secondary school. According to the finding of the study, the use of tablets did have an impact on both learning and teaching. During the study six focused group interviews of each ten representatives were carried out. In the beginning of the study twenty (20) boys aged 11 to 14 were asked to be the part of a focused group. Similarly, twenty (200 girls aged fifteen (15) to eighteen (18) also participated. Among the invited forty (40) boys and girls, nineteen (19) girls and twenty (20) boys participated in the interviews. Two teams of ten teachers were made who were according to the required criterion, owing to practical issues. There were only two teachers who did not participate in the proposed study. The duration of the interview was ninety (90) minutes, which was conducted for each group to investigate their perception after using tablet devices for six (6) months. Moreover, the explorative questions were categorized into four. The students and teachers both were asked the same questions. The transcribed conversation was then run through a software called 'NVivo' which is used for a qualitative data analysis. Three themes were chosen accordingly. The findings divided teachers into two categories such as instrumental and innovative. The innovative teachers are the ones who believe in shifting from outdated teaching approach to a new learner position. The innovative teachers have changed their teaching methodology in the direction of the benefits the tablets offer. While on the other hand, according to the study, the instrumental teachers are the ones who had been seen as using the expedient as a manuscript behind schedule. The difference between both the categories of the teachers has repercussions in the form execution and students' experience. The tablet devices provide some new ways and things for learning. The findings of the study suggested that technical and pedagogical things should be introduced to facilitate both students and teachers.

Wei et al., (2016) conducted research on the topic titled as bond sandwiched between teacher ICT capability, reception, and habit of SMS. The study was non-experimental one. The study used survey as a tool. A set of questionnaires were used in the study to collect the data. The study used quantitative methods in order to explain the effect of one variable over the other. The questionnaire was a cross sectional as well as self-determined one. The population of the study was Negeri Sembilan secondary schools in Malaysia. The research analyzed four hundred and seventeen (417) questionnaires. According to the results the participants of the study marked themselves high in terms of competency, SMS, and acceptance. MR was used for the analysis of the data. After the MR analysis, the study displayed that professional growth, guidance, smart pedagogy, and digital citizenship were some of the ICT competence dimensions of teachers identified. These three dimensions are important predicators significantly. A prototypical figure was recognized for learning. The study suggested that the policy makers should pay heed to designing some PD programs in demand for to inculcate them in the minds of teachers so that it helps the education system.

Eickelmann and Vennemann, (2017) conducted a study on teachers' beliefs relating to ICT use in European republics. The study focused on examining if there is any topology of pedagogues when there are various attitudes towards the potential of ICT in terms of learning. A dormant session investigation was conducted in order to address this question. The sample for addressing the question was taken from three countries such as Germany, Norway, and Czech Republic. The purpose of the sampling was to get a representative sample from the mentioned countries. The study also investigated how the groups of teachers differ in terms of using computers. Moreover, the study used LCA approach. There were basically two reasons for choosing the LCA approach. The first reason was that the LCA does not require any pre-experimental

hypothesis. And the second reason for choosing the LCA hypothesis was that a solution may be compared in terms of measuring regarding obtaining the resolution for the assumed data. For comparing model fit, various measures were considered. The analysis of the study uncovered some interesting things. The findings of the study revealed something interesting such as it was proclaimed that the methodological confinement and forthcoming research need to be discussed and addressed. Moreover, the pedagogues were inquired about the number of times they used technology in the class. It was reported that social desirability may affect the given estimation which may result in not reflecting the exact use of technology. The same goes for the agreement and disagreement question which was asked by the teachers.

Adil et al., (2013) conducted a study on ICT and gender differences in Pakistani context. The study examined the awareness of university teaching employees about the use of ICT in the campuses of Pakistan. Fifty-seven (57) universities' teachers took part in the study. A purposive sampling technique was used in the study. All the fifty-seven (57) teachers were from the Public Sector. Among the fifty-seven (57) teachers twenty-nine (29) were males and twenty-eight (28) were females. The age of the teachers who participated in the study varied from twenty-six (26) to fifty (50) years. To collect information, the open-ended opinionnaire was used. The study also showed the availability of internet facilities in the offices of the teachers joined the study. The researchers used a chi-square test to calculate the association among different variables. Moreover, the researchers used gamma to calculate the strength of association. Furthermore, a quantitative research method use used in the whole study. The researchers counted the staff of all public sector universities of Lahore and the figure they got was five thousand six hundred and thirty (5630). The total was then divided by hundred (100) and then the equation was fifty-seven (57). Therefore, the sample of

the study was fifty-seven (57) teachers. During the count the study found that the number of teachers in university of Education, Lahore were five hundred and sixty 560, the number of teachers in the university of Lahore were nine hundred and twenty (920), the number of teachers in University of engineering and technology, Lahore were nine hundred and seventy (970), the number of teachers in University of veterinary and animal sciences, Lahore were eight hundred and twenty (820), the number of teachers in University of the Punjab, Lahore were two thousands three hundred and sixty (2360). Two hypotheses were made in the study in order gauge the views of university' teachers in terms of using ICT in educational institutions of Pakistan. According to the first hypothesis the time spend while using technology decreases with the increased age of the teachers. It means that if the age of the teacher is more means an age on then the time, he/she will spend using computer will be not up to the mark. It may be owing to the increased responsibility with age a person may not be able to give proper time to using computer technology. Moreover, according to the second hypothesis of the study there does not seem any relationship between the gendered categories of teachers and the time spent on using computer technology. The reason for no difference in terms of gender was that both the genders are provided with the same ICT facilities. It was concluded that there was a negative association between age and computer usage on daily routine. Gender differences also did not affect computer usage. Adil and et al, (2013) recommended that awareness and training is necessary for integration of ICT in education system.

Khan et al., (2012) led a research line with the topic titled as hurdles to the application of ICT in unindustrialized states. Bangladesh was taken as example. The study aimed to review some of the work based on barriers of introducing ICT technology in class. The study was carried out in Bangladesh. The study reflected that

the operation of the ICT in curriculum of Bangladesh is hampered by some constraining factors. The study recommended that the government of Bangladesh, teachers, students, community, and parents need to be committed to implement ICT in the education system of Bangladesh. It is important for all the stakeholders that they know the significance of technology in the classroom. Insufficient resources act as an obstacle in terms of implementing technology in a country like Bangladesh. The government of Bangladesh needs to formulate some storages to support and encourage the girls and women of Bangladesh to get adopted to ICT. As without the empowerment of women, it can only be a dream to implement ICT in the education system. Moreover, the study suggested that the local software companies of Bangladesh need to work closely with pedagogues of Bangladesh to produce some Bangla software for the teachers as well as students especially those who cannot speak English. Teachers and the software designers should work together to develop software that can be used in teaching. Training should be arranged to train the in-service teachers. Furthermore, the study suggested that the teachers should be confident after the implementation of computers in the classroom. The teachers need to know the importance of computer use in the classroom so that the students benefit from it. Moreover, the study reported that ICT is something new in the context of Bangladesh, therefore, there is a need to conduct some more research on ICT so that it helps the education system.

Izquierdo et. al, (2017) conducted a study, which discussed the curriculum keep on changing and the financial investment is invested to make computer technology part of the education as well as a part of the English language learning process. The study basically examined ICT which in fact has become the practices in educational settings especial of English teachers who interact with young learners of English language. The study used a mixed method. It was a quantitative qualitative descriptive study. The

study collected quantitative data with the help of a descriptive-exploratory design. Likert scale questionnaires was used to collect the data. The questionnaires were distributed among teachers and their students who were learning English language. Moreover, a multiple case study was used to assemble the qualitative type of information. Almost one hundred (100) teachers were contacted to collect the data for the study. The teachers were from secondary schools. It was conducted in grade three (3). Apart from the teachers who join the training as participants, the number of (learners) was two thousand nine hundred forty-four (2944). The qualitative data was collected from six teachers via longitudinal observations of class, the visits of schools and teachers and administrator interviews. The study revealed that the use of mobile phone multimedia assisted funds is something emergent in the case of L2 classrooms. To meet the requirement of modern day need the teachers preferred to use their own computer, laptop and cell phones rather than using such devices of their schools.

Badran et. al, (2021) conducted a study on a topic adaptation of technology during pandemic covid-19. The study as the title shows was conducted in the context of Egypt. The study was a descriptive quantitative survey which investigated the perception of Egyptian teachers on ICT. The study used the diffusion of innovation theory. This theory talks about the diffusion and adoption of technology. The method of the study was a type of a review. The participants were teachers as they are the first people who transfer education. The study used a non- probabilistic snowballing technique of sampling. The population of the study were the secondary school teachers. The teachers of the targeted residents were from free public and private schools. Two hundred and twenty-one (221) teachers from the target population took part in the study. The conclusions of the study showed that the perspectives of most of the participants were positive about the integration of ICT. Moreover, average views regarding the

complexity of ICT and some negative views on the compatibility of ICT. Furthermore, the findings of the study reflected multiple challenges which can have an impact on the decision of teachers' weather to adopt or reject the reforms which also include communication problem, and human resource availability and access to technological infrastructure.

Chow, (2015) conducted a study on a topic titled "Teachers' attitudes towards technology in the classroom". The study focused on discovering the opinions of the trainers vis-à-vis the practice of knowledge in a classroom. The target teachers were from Toronto and York regions. These teachers were teaching different subjects such as Arts, Mathematics, physics, special education, history, geography, and music. The data was collected through interviews. The target population of teachers were interviewed. The interviews were either recorded by microphone or recorder. The recorded interviews were transcribed by using a special software called Dragon speak. The maximum time for the interview of a single person was thirty (30) minutes. According to the findings of the study shows that age is not something that can determine the perception of technology as the findings of the study varied such as some of the younger teachers were not comfortable with using technology, while some of the aged teachers were found comfortable with using technology. Moreover, the study found that teachers were more comfortable with using the technology in their classrooms than the one they use in their personal lives. Whenever the schools have provided some new technology to the teachers, the teachers found them having little effect on their perceptions related to technology.

Fu, (2013) conducted a study on a topic titled as "ICT in education: a critical Prose evaluation and the Suggestions". The study basically summarized the literature

produced on (ICT) in the field of education. The project focused on those studies which have touched the merits ICT incorporation in the classroom and schools. Moreover, it also talked about the challenges, and obstacles in the practice of (ICT). Furthermore, the study discussed the attitude, confidence, and perception of teachers towards using ICT. The study also discussed the importance of school culture in terms of using information communication and technology (ICT).

Islahi and Nasrin, (2019) conducted a study on a topic titled “exploring teacher defiance towards (ICT) with a gender perspective”. The study is attentive on gender perspective for using information technology. The surveyed four hundred and eighty-two schools in India. It used attitude towards information technology as a scale. Four dimensions were incorporated to examine the attitudes of respondents. These four dimensions include: its significance in life, productivity for the teachers, and usefulness of information technology for the students, the interest and acceptance of teachers. The study was open. The inhabitants of the study were the secondary school teachers of the Aligarh city of Uttar Pradesh, India as well as its nearby areas. The sample of the study was four hundred and eighty-two students which includes two hundred and forty-five (245) males and two hundred and thirty-seven (237) females. The percentage of males in the sample was 50.88 %, while the percentage of females in the study was 49.17 %. The study used a purposive sampling technique and teachers from thirty (30) different schools participated in the study. The study chose only those specific teachers who had any sort of experience of information technology. The age of the teachers was from twenty-two (22) to sixty (60) years. The experience of the participants was from one (1) year to thirty-eight (28) years. The scale of the study was thirty (30) statements which include eighteen (18) affirmative remarks and twelve (12) statements of negation. The scale was both in English and Hindi version accompanied by a letter

elucidating the aim of the study. Each of the teachers was supposed to respond to the statement by means of the five-point ATIT Scale and they would tick mark in the appropriate box. The consequences of the study exposed that the pedagogues had their positive attitudes towards information technology regardless of their gender. The teacher viewed that technology had an immense importance in terms of its usefulness for teachers as well as its productivity for teaching. Moreover, the study revealed that the teachers had interest in adopting as well as accepting information technology (IT) in the educational system. The maximum use of (IT) has diminished the gender differences in terms of their perception regarding information technology (IT). Furthermore, the availability of computers in the homes of teachers also has tremendous impact on the attitude when it comes to using it in the classroom.

Serin and Bozdag, (2020) conducted a study on the interrelationship of teachers' behavior and technology in the schooling process. Self-analysis of ICT use in instruction was the one dependent variable. The emphasis of the study was to inspect the attitude of the teachers related to the use of technology in the field of education. To conduct the study, the data was collected from four hundred and forty (440) teachers. Rendering to the grades of the research, the behavior related to use technology inside the classrooms never changes with gender and the type of school, however, it changes with the education level of the teachers. Moreover, as far as the autonomy behaviors of teachers is concerned, it is something different in different schools. Professional seniority does not make a difference in terms of attitudes towards the use of technology in instruction as well as autonomy attitudes.

Korlat et al., (2021) conducted a study on a topic titled as gender variation in the application of ICT in the covid-19 situation. The intrinsic and extrinsic hurdles,

values principal and administrator support were also examined. The novel covid-19 changed the education system in footings of necessitating the use of technology which in fact acts as a challenge for the disadvantaged groups in the virtual classrooms. This study incorporated both biological sex and gender role to investigate the role. The number of students who took part in the study was nineteen thousand one hundred ninety (19,190). The population of the study was Austrian students. The study was conducted online. The study was carried out in April 2020. The participants were secondary school students. The findings of the demonstrated that the higher perceived pedagogues second the intrinsic values and engagement in the digital learning. As far as the gender difference is concerned, the study did not come across any gender difference in terms of competence beliefs in digital learning.

Bhattacharjee and Deb, (2016) conducted a study on a topic titled "Role of ICT in 21st Century's Teacher Education". The study absorbed on discussing the character of (ICT) in twenty first (21 first century). The study talks about the reputation of ICT for both in-service and pre-service teachers. According to this study ICT is a scientific, technological, and engineering field as well as a management technique which is broadly used in handling information. It stands for information communication technology. Since last few decades, (ICT) has been the part of human's lives. It is now widely used in all walks of educational life. It is used in the teaching process to make it easier and facilitative for the students. A competent pedagogue usually has a dexterity in providing something successful in teaching. A teacher needs to have the knowledge of ICT. In this modern technological time, societies require more skillful teachers. ICT is transforming and leads towards technology in the educational system. It also helps in bringing teachers, parents in students together. The knowledge of ICT is direly needed for the teachers. ICT helps teachers to meet modern-day needs. According to the

findings of the study, the use of tablets did have an impact on both learning and teaching. During the study six focused group interviews containing 10 participants were carried out. In the beginning of the study twenty (20) boys aged 11 to 14 were asked to join a focused group. Similarly, twenty (200 girls aged fifteen (15) to eighteen (18) also participated. Among the invited forty (40) boys and girls, nineteen (19) girls and twenty (20) boys participated in the interviews. Two teams of ten teachers each were made up according to the required criterion, owing to practical issues. There were only two teachers who did not participate in the proposed study. The duration of the interview was ninety (90) minutes, which was conducted for each group in order to investigate their perception after using tablet devices for six (6) months. Moreover, the explorative questions were categorized into four. The students and teachers both were asked the same questions. The transcribed conversation was then run through a software called 'NVivo' which is used for a qualitative data analysis. Three themes were chosen accordingly.

The findings divided teachers into two categories such as instrumental and innovative. The innovative teachers are the ones who believe in shifting from a long-standing approach to a new learning method. The innovative teachers have changed their teaching methodology in the direction of the benefits the tablets offer. While on the other hand, according to the study, the instrumental teachers are the ones who had been seen as using the expedient as a book behind the glass. The difference between both the categories of the teachers has repercussions in the form execution and students' experience. The tablet devices provide some new ways and things for learning. The results of the study suggested that methodological and didactic approaches should be introduced to facilitate both students and teachers.

The report of the UNICEF which was conducted in (2013) reported that more than 6.6 million children are not admitted to primary schools, and some 2.7 million are not admitted to secondary schools. According to the same report the number of girls is more than that of boys who are not enrolled to schools. The report confirmed that 39.8 percent of the girls are not enrolled in primary schools. While 30.2 percent of the boys are outside of the school. The ratio of poor students is something more than that of the rich students who are not enrolled to schools. The dropout of students is the reflection of the fact that majority of the students do not carry on their education after primary education. There, in fact, are some theories which show the underlying reasons for the dropout. Children educations are basically influenced by factors such as social, individual, and institutional. Economic factors also have an impact on the dropout especially in the rural areas children more likely go for doing a job rather than getting education. According to the organizational theory the dropout of the students is because of the organizational features. Imran (2012) says that organizational theories are something related to the overall environment of the community.

Khan, azhar, and shah, (2011) argued that this theory basically integrates the social, psychological, and organizational perspectives which treat the dropout process of the system as a dynamic system between environment and the individuals. This includes both the informal social organizations and the personal communication that take place between students which act as a significant factor in terms of influencing the dropout of students. The list of interaction shows a complete perspective of the dropout process by means of integrating organizational, social, and psychological perspectives. This concept of human capital was applied by the economist Schultz (1961) and Becker (1964) to suggest that human beings usually benefit from investing in the ground of education, health, training, and nutrition. This can be increased by means of experience

and training. They can select either of the two, to go for a job or to universities for monetary and non-monetary returns. A job which is indeed a low paying one. These theories, therefore, show that the intellectual attributes, psychological behaviors of students and the adaptation to the environment are the decisions that decide to either stay or remain outside the school.

Gudmundsdottir and Hatlevik, (2017) conducted a study and the study was basically survey research in which three hundred and fifty-six (356) newly qualified teachers were observed in Norway. The report of the pedagogues who were qualified recently, related to ICT's contribution in the training was something poor. The study was basically a national survey and the teachers who were studying for two years were considered. The study used a opinion poll for the statistics collection. Initially the questionnaire was sent to the email addresses of nine hundred and twenty-five (925) teachers who were newly graduated. Out of the total teachers only one hundred and fifty-seven (157) teachers responded to the questionnaires. To get more responses some calls were made to seven hundred and three (703) teachers. After the recruitment phase the email addresses of one thousand and sixteen (1016) were taken from five hundred and eighty-one (581) schools. Three hundred and seventy-five (375) teachers responded to emails. The responds of nineteen (19) teachers were omitted. The entire number of three hundred and fifty-seven (357) teachers' responses were analyzed in the study. The conclusion of the study is founded on the analysis of the three hundred and fifty-seven (357) responses of the teachers. The findings of the study suggested that there is a need for some more researchers to train students and teachers to use ICT properly. It means that there still exists a big room for research in the same domain. According to the study, the newly qualified teachers have positive as well as negative experience of using

ICT. Training of ICT for schoolteachers is something mandatory and it plays an important role in modernizing the education system.

Elstad and Christophersen, (2017) directed a study on teachers and student's digital proficiency for the growth of instructional techniques in a technological setting. The study focused on exploring the beliefs of Norwegian teachers and students about the potential antecedents of instructional self-efficacy. The study was conducted in the Norwegian context. The significant finding of the research was that the association between the teachers and students was something an amazing one regarding the perception of digital capability to resolve the challenges. Their perceptions showed that digital capability can easily solve challenges. The participants were from the Norwegian university. The participants were from the department of Mathematics, social sciences, Humanities, and natural sciences. First, a pilot study was conducted. All the students willingly participated in the research. The total number of participants was one hundred and four (104). It was a cross-sectional survey and for the data collection a questionnaire was distributed among those who were taking part in the study. The consequences of the study have some suggestions for the teacher education programs. A prototypical student and teacher will always experience a situation that will demand a technologically rich environment. In such a situation the experience they gain will be significant in terms of adding to their personal grooming and growth.

Agbo, (2015) conducted a study on a topic the aspects of persuading the ICT in Ebonyi state of Nigeria. The study used a qualitative approach. The data was collected from four types of people such as parents, educators, IT professionals and principals which means that people belonging to domains of life took part in the research. The study examined those factors that were having some serious impacts on the use of ICT.

The factors of both home and school related environment were investigated in the research. Three secondary schools were selected for data collection in a specific area which is called Ezzangbo. Moreover, four schools were selected in an area which is called Ngbo, and three schools were selected in the area of effluvium. The population consisted of both male and female students. Moreover, teachers, administrators of schools and the parents of the students were also part of the population. The study included fifty (50) students from each school that was selected from the population along with their parents and principals. Moreover, the study included twelve (12) teachers from all the selected schools. The researchers used a purposive sampling method in their study. Different instruments were used by the researcher to collect the data from the participants. These instruments include face to face interviews, observation, and conversation.

The findings of the study highlighted five features which influence ICT use in the case of knowledge and coaching CPU. These factors include the attitude of students to computer usage, the level of availability and the price of ICT equipment, the training regarding ICT for teachers, and the support of parents and community. These five factors were found to have a remarkable effect upon the use of ICT in learning and instruction computers.

Afshari et al., (2009) conducted a study on the topic titled Issues of distressing teachers' ICT performance. According to the current study the previous studies in the last decade have shown that the use of ICT in educational institutions is an effective means for making the educational opportunities bigger. However, a great number of teachers do not use computer technology despite its effectiveness for one or the other reason. Many studies have revealed a plethora of factors that influence pedagogues to

make use of technology in classroom, in demand to have an effective learning transformation. These factors include two main factors that are manipulative and non-manipulative pedagogues and school factors. Individual factors according to the study, has nothing to do with the success as a result of the execution of ICT. However, its dependency is on a set of some connected factors. It is basically recommended by the results of the study that teachers must be provided with some professional development training.

Nevertheless, it is something very remarkable for the pedagogues' trainers as well as policy creators to comprehend the influencing aspects that are usefulness and the cost-effectiveness of various methods to use ICT. The strategies of training need to be explored thoroughly to make them feasible for all. Generally, the computer has got the heed of educational community in this modern time. It performs a variety of tasks and functions, and it is quite helpful in the field of education. It helps in solving intricate problems in the field of education. ICT is basically used in three different ways in the field of education. It is used as a discipline and a medium for learning and teaching. Moreover, it is also used as an aspect which means that the development of amenities connected to the ICT. The ICT as an object in the field of education means learning or getting knowledge about it. The use of ICT as an aspect in the educational institutions means the evolution of skills which are used for professional and vocational purposes.

Palak and Walls, (2009) conducted research on topic titled as "Teachers' Beliefs and Technology Practices". The research focused on finding the association between the credence of teachers and instructional technology practices. It was among the teachers who had worked in schools that were rich in terms of technology. The research showed that the teachers use technology for management, preparation, and

administrative purposes. According to the findings they use technology for supporting students' practice in a new technological way. Moreover, they continue the use of ICT in technology rich schools to buttress the teacher centered instructional practices. The study concluded that there is a dire need for incorporation of technology in the curriculum in the future. Moreover, the study recommended for the future researchers to use mixed method and do consider the beliefs of the teachers if there is a desire for a change in practice.

Zhang et al., (2021) investigated the factors that are responsible for the transformation of teacher's methods in terms of the use of ICT in methods used by the teachers in their teaching. This research divided the teacher ICT-integrated teaching behaviors into students centered teaching behaviors and teachers centered teaching behaviors. Moreover, the study also made a hypothesis on factors that influence teaching behaviors. The data was collected through questionnaires from primary and secondary school teachers. The data was collected from seven hundred and ninety-five (795) teachers. The participants were from twelve different primary and secondary schools having different economic development level in China. The teachers who were invited to take part in the study via questionnaire were the people who had expert experience. The questionnaire was distributed online among one thousand and four (1004) participants. The response rate was 79.2 percent. Seven hundred and ninety-five questionnaires were collected during the months of March and April 2021.

According to this study the social environment has an impact on teacher's technology application. The study adopted SEM for analyzation of the data. The answers presented that both teachers centered and student-centered behavior request to correlate positively. Moreover, the study found that the outcome expectation was also

positive for both student-centered and teachers centered ICT behaviors. The study also reported that unlike the previous studies application environment had no impact because of the development of ICT. The division suggested by the study in the form of teachers' centered behavior and students centered behavior enables us to comprehend the condition for the teachers to change their teaching methods in the direction suitable for learning. It thus helps us to support the progress of learning centered education. Furthermore, the dissection also clarified the importance of categorizing information which was based on teaching behaviors. In addition, this study also separated self-efficacy broadly into two cleaves. These two groups are efficacy belief and outcome expectancy. The verification as well as adjustment of the hypothesis which is proposed in the study let us comprehend the organizational network related to teaching environment.

In previous literature, numerous lessons have been publicized on SSTs belief in using ICT in instruction. For instance, Scherer et, al. (2015) highlighted that perceived usefulness is an important element in integrating ICT and acceptance by teachers. A positive relationship was found between usage of ICT and self-efficacy.

Similarly, Teo, (2009) identifies that the perceived usefulness, self-efficacy, and attitude towards use of computer has a direct upshot on the acceptance of technology by teachers. Whereas conditions that can affect acceptance of technology by teachers include complexity in operating technology, perception about ease of use, and conditions to facilitate the user. Moreover, another factor that can affect the teachers' perception about acceptance of technology is the level of knowledge teachers have. They also found that teachers with positive feelings about the use of technology are

likely to continue using technology for a longer time period, if positive attitudes are sustained by the usage (Teo, 2009).

Gil-Flores et, al. (2017) identified that the use of ICT by teachers can be separated by two levels. In the first level, teachers use ICT for basic support, which is an ineffective use. While, in the second-level teachers use ICT as an educational resource in their routine work with students, which is an effective use of technology. Moreover, Gil-Flores et, al. identified reasons that can influence the usage of ICT in classrooms including educational software's availability, teachers' collaboration, training opportunities of ICT usage for teachers, and perceived self-efficacy. It was also initiated that it is the major focus of the educational systems of the world that the aim for the development of digital competency of the students. This is the major reason for inculcating the learning of new technology in the syllabus of the student.

Gil-Flores et, al. (2017) argued that the ICT has always been the most important learning tool since the past. Many institutions try their level best to increase the number of computers and technological machines in their learning environment. Similarly, Tondeur et, al. (2007) argued in favor of using the ICT system in education that the ICT is a valuable tool for study, an efficient source of information, and a great support for teaching.

According to Paudel, (2020), the usage of ICT technology in schools has a major focus on finding, examining, and establishing information to provide students with immense level of reliable study resources. The study argued that this usage of ICT can be very positive endeavor in the education sector in countries like Nepal where students and teachers do not have much physical resources. Furthermore, this usage of information and communication technology provide teachers and students a real-life

face-to-face contact and expose them to the practices of other countries where diverse languages are spoken and taught, and different cultures are being practiced. Additionally, the study also highlighted that the practice of using the traditional information and communication technology mechanisms is an indicator that the teachers lack the competency level to operate and utilize the advanced and effective learning tools. It was suggested that the teachers must be motivated and ensured in their skill level and confidence in order to truly integrate the learning environment with the use of ICT tools.

Similarly, Buabeng Andoh (2019) reported that technology is professed as a major factor for the current educational systems. The importance and the use of ICT cannot be ignored, however, the study found that most instructors are not willing to adopt for the integration of ICT and their teaching. This implies that they lack the required competency or confidence to learn and adopt these innovative methods of teaching. Their results showed that teachers' use ICT was motionless restricted to basic and out-of-date events such as search for information, class presentation etc. Likewise, Ethiopian government policy is committed to integrate (ICT) in education to recover enlightening, excellence, and justice in the structure. As educators are the building blocks for achieving this goal, the administration has encompassed ICT segments within trainer work out to realize ICT inside the laboratory or workplace (Jang,2020).

The research explored the various influences which simplify the pressure of mentor in the ICT implementation from teachers' training to secondary level classrooms. They investigated the teachers' theories that figured out the persons' outlooks and arrogances toward ICT. Ultimately, their discoveries displayed that SSTs optimistic universal didactic principles to implement ICT in instructional planning.

In their exploratory study Hu (2017) found that personal beliefs and attitudes of teachers are closely linked with the ICT usage in education. The study also observed that this link varied among different levels of adopting information and communication technology while making decisions of their usage in education. The study also evidenced that there is a link between contextual factors and teachers' willingness to adopt the ICT in educational institutions. It has been argued by researchers and thinkers that the most prominent aspect of our life is change. There are many studies that put the greater emphasis on the usage of innovative learning methods especially, via using the technology.

In the present era i.e., 21st century there is a greater need to constantly learn new things and evolve accordingly. Studies like, (Dorfberger and Carmi, 2017) argued that in this era of innovative technology and rapid change, it is important to continuously learn, and there is a dire need to get familiar with emerging technologies. The study endeavored to examine the different manners and attitudes concerning the usage of technology between teachers and students. The study found that usually people are afraid of changing circumstances or situations, not only due to being exposed to new or different things, but rather they do not comprehend the meaning of that something in depth. A further point the study added is that, when people are guided about the new things, and ambiguities get eliminated, then people start realizing and accepting the importance of that newness of the situation or thing. So, the provision of ICT technology is important but providing the proper guidelines and methods to use them in an effective manner is the most important. To support the argument of providing effective learning materials for teachers as well as students.

Kirkscey, R. (2012) highlighted that the teachers, particularly those having six to nineteen years of experience of teaching, felt they require more learning opportunities for greater understanding of new technological methods of teaching and their applications. The study further said that the more teachers understand the new innovative technologies, the better it will be for students to understand them well. Likewise, some other studies like Chowdhury (2009) found the link between college teachers' perception of using the information and communication about its effectiveness. The study also tried to explain whether a connection existed between staff beliefs and works on regarding data and correspondence innovation coordination, and regardless of whether there were contrasts across orientation, disciplines, innovation experience, and showing experience in personnel insights and utilization of data and correspondence innovation.

Other studies like Jimoyiannis and Komis (2007) analyzed and revealed that there is significant role of personal characteristics like gender, expertise, and experience influencing their beliefs about usage of ICT in academia. Some studies argued in the opposite of implementing ICT in classroom throughout the learning processes. Their arguments were in the favor of traditional teaching methods, and they suggested that adoption of teaching methods should be in slower rate in such a way that teachers and students adopt them by the time with good level of concentration and understanding.

For example, Ningisih et, al. (2020) found in a study that adverse possessions of using information and communication technology can bring some adverse effects in the context of primary schools. Ningsih also argued that sometimes, the unavailability of the technology can also make the situation go worse. Contrary to that, Jang, (2020) conducted a study a study to find out the effects of low-level usage of ICT practices in

the field of education, particularly primary schools of education. The study identified three major fields that can affect the level of ICT practices. They include, training of the teachers, beliefs of the teachers, and material used in the process of learning.

On the other hand, Paudel, (2020) concluded that there is a significant level of motivation for using the information and communication technology among majority of teachers even if they do not have that much skill to use this technology, or maybe they do not have much confidence in using the new ICT apparatuses and their respective applications in the arena of ICT in the field of education. This can be the chief hurdle in a process of achieving the educational goals effectively and efficiently hence, can result in the negative impact of using the information and communication technology.

Furthermore, Hermans et, al. (2008) found that constructivist and traditional beliefs of teachers are precursors of using computer in the field of research. The study extracted some conclusions in which they argued that the usage of (ICT) can barely be called as 'innovative' in the context of its nature. They concluded their study while suggesting through their findings that it seems the usage of an integrated classroom can be negatively impacted by the traditional beliefs of the teachers, and on the other hand the constructivist beliefs of the teachers are significant predictors of using the classroom in general. In addition, Hannafin and Land (1997) argued that it has been challenging for the educators to find out the best teaching and classroom methodologies which can be very helpful in achieving the goal of getting the optimized return from the process of learning. On the other hand, the study pointed out that contemporary concerns there is a greater emphasis on the student-centered approach of teaching, which have invigorated a positive change of focusing on the advanced teaching and learning approaches. The study's major focus was on studying the difference between traditional

and student-centered methods on the way to spread literacy rate in encouraging ratio among schoolchildren.

The study reported in detail, there is a dire need to formulating the learning systems that motivate the analytical reasoning of the students and develop critical thinkers in the society. There has been always a greater emphasis on provision of the student-centered atmosphere as an average block to backing the alternative of coaching and learning approaches. In the era of technology, where the technological advancement is very rapid, and increasing in the higher rate, it will be very easier for the innovative alternative ways of teaching and learning to grow, and hence barriers will be removed for the growth of an advanced methods.

In this era school student are called digital natives, the new students and the new children's are used to technology which will help not only in to their life's but in to their educational and career planning and definition of their fields (Prensky, 2001) The rapid growth of the Information Communication and Technologies (ICT) in the 20th century is observed, on one side the remarkable changes are seen after the intervention of Information Communication and Technologies (ICT) but on the other hand the ICT effected the demands of the modern institutions, organizations and society and is changing and is being advanced. it is a renowned fact that Information Communication and Technologies (ICT) is playing a very important role in our daily life and the educational and other organizations (Buabeng-Andoh, 2012).

As we see the global investment in (ICT) related programs and situation builds, to helping the learning in educational institutes for examples schools, colleges, universities and other vocational and technical institutes and these programs are appreciated by the government and the government institutes and regulatory bodies

(Buabeng-Andoh, 2012). Keeping all these developments in mind, which is taken by government and other international bodies many of the limitations are there in educational institution and educational field. In many studies it is discussed that the institutional factors and technological factors assist and help teachers to use the computers and Information Communication and Technologies (ICT) which is very help full in the overall learning process, which can improve the learning capabilities and the learning and teaching process (Buabeng-Andoh, 2012).

There are many barriers which must be kept in mind, the barriers includes the shortage of teachers Information Communication and Technologies (ICT) skills and related skills, lack of instructor confidences on Information Communication and Technologies (ICT), shortage of pedagogical skills in the instructor, lack of software related to the field of education, limited access to Information Communication and Technologies (ICT), Inflexible construction of old-style and old educational system, and the curriculum barriers, these are the main barriers faced in the educational sector and Information Communication and Technologies (ICT) (Buabeng-Andoh, 2012).

The active and well-organized incorporation of data Communication complete Technologies by ICT drive provided in schools, colleges, and universities and into the classroom procedures and methods will generates a question and ways for instructors and coaches, the link up with the computers and network will help them to learn and groom (Buabeng-Andoh, 2012). There must be steps taken for the successful addition and incorporation of (ICT) into education and teaching field (Buabeng-Andoh, 2012).

ICT in the field of education and teachers and students is in light from last 8 to 10. There are two main and recent extensive procedures and universal reviews (Fraillon, et, al. 2014) in these surveys the findings were, when the teachers are additionally and

specifically aware and accustomed with (ICT) and when they have more confidence and assurance in using (ICT) in their previous teaching experience and now after the adoption of Information Communication and Technologies (ICT), their active use of ICT was still incomplete and marginal (European Commission, 2013).

The language teachers have many barriers in teaching their native or other language which can be solve by the help in the adoption of (ICT) in the system and the schools or other institutes, it will solve the problem of communication and the gap between the learning and teaching gaps (Liu et al., 2017).

Many subjects like science, math, languages, arts , commerce, business, the physical education is evolving and developing in the term of (ICT) in to the normal classes, it is an innovation in the schools that the physical education classes and it involves many various parties in this process by which the teaching process will be effected, Students of all levels , principals, head of departments, parents and the siblings, administrators of the institutions, policy makers of the country and legislative authorities, and in the schools and intuitions , the Physical Education teachers and instructors themselves are involved in the process of addition of Information and Communication Technologies (ICT) in to their classes and subjects (Kretschmann, 2015).

Tondeur et al., (2012) have examined the learning performance in long term impact and the follow up evaluation which will have an influence on the entire company. To grow and polished an organized and inclusive summary on (ICT) and its expertise and it know how for competent and professional teachers in advanced tutoring, the evaluation model of Kirkpatrick is very useful for evaluation (Kirkpatrick,

1998). In a study it was found that, the teachers who are not in favor of adoption of ICT in their field or organization or who have a negative thought about the ICT and its adoption these teachers were not having the knowledge about the ICT or they do not want to learn it for the future and growth perspective, that was the main reason due to which the teachers were against the adoption of ICT in their organization (as cited in Bordbar, 2010).

Ali et. al, (2020) has conducted an observation to practice and equalities of ICT in instruction and innovation in the field of education. For this purpose, the public and private sector schools of Punjab were analyzed. Two hundred and sixteen (216) teachers were taken from each sector of Punjab province through two stage random sampling methods. For data collection a self-developed tool was used having nine indicators. For analysis t-test and ANOVA was used. It was found that public and private sector secondary school teachers (SSTs) mostly differ in using ICT and digital skills in this regard. It was also observed that private sector SSTs were more innovative and competent than public sector SSTs. It was suggested that accessing to ICT tools incorporation in teaching and SSTs interest remained the two main indicators in application of technology in teaching learning process. It was recommended that the government collaborate with private schoolteachers to train the public sector teachers.

Sareen, (2019) observed schoolteachers' attitude about ICT use with relation to self-efficacy and perception. Two hundred and fifty (250) sample size were selected from government and private sector. One hundred and thirty (130) schoolteachers were selected from the government sector and one hundred and twenty (120) from the private sector. Cavas Bulet (2003) tool was being used to collect information which was established by Gulbahar Yasmin and Guven. Ismail (2008). It was found that a

significant difference exists in gender as well as in self-efficacy. Private school teachers were found to have a better level of efficacy and attitude towards ICT use in the teaching process. It was suggested that the concerned authorities may provide before-service and during-service training to teachers for enhancing their ICT incorporation skill to develop a good and positive attitude towards ICT use in education institutions.

Jogezai et al., 2018 studied SSTs concern about ICT mixing in the perspective from the emergent portion of the sphere. For this resolution, explanatory mixed method research design was used. Three hundred (300) Pakistani SSTs were identified for the quantitative purpose and thirty-five (35STs) from qualitative fragment of the teamwork. (SoCQ) were assumed for statistics assemblage gadget. For qualitative purposes a special type of interview was planned and conducted. Mostly teachers were found at initial stage of integration of ICT in teaching process. Informational as well as personal concerns of SSTs about the use of ICT are big hindrances in this regard. Time management and resources were considered the main factors for ICT use in teaching and integration of technology.

Islahi and Aligarh, 2019 explored teacher attitude towards ICT with a gender perspective. A survey design was used for four hundred and eighty-two (482) SSTs from India. For data collection attitude towards information technology tool was used. The SSTs attitude were measured in four dimensions such as significance in life, usefulness for students, productivity for teaching and the fourth one is the SSTs interest and acceptance. Data was in quantitated form. T-test and ANOVA were used for analyzation. No significant difference was found in gender due to some factors like training, location of school, material status, medium of instruction etc. It was

recommended that due consideration is needed for SSTs attitude towards ICT use in teaching.

Yieng and Daud, (2018) concluded that like the present strong status of student's unmatchable ability every kind of teacher should put in maximum potential and skills they must integrate ICT at the peak. So that students reach the best level they can in ICT environment. The teachers must perform a much bigger role to make ICT as common as possible in any field of education. For this purpose, continuous professional development (CPD) of teachers is extremely necessary. Without training of teachers, the concept of quality education in the country seems difficult.

Munir and Khan (2015) evaluate the ICT integration expertise of teachers and its application in classroom. The outcomes of the work exposed that 75% educators of the sample were trained, 67% teachers having computers at home as well as in schools, 53% get availability of internet access at schools and home. It was concluded that teachers were aware of using e-mail, internet use by searching materials for lecture preparation and word-processing. It means that there is no problem of ICT integration. Tools of ICT are mostly available, and teachers are competent to use it. Teachers use computers for note preparation, paper composing and material collection for lectures and sharing with students and colleagues.

Akhtar and et, al. (2014) checked the emerging trends, use, present status and problems regarding implementation and usefulness of ICT at secondary level in Khyber Pakhtunkhwa, Pakistan. A great contrast was found regarding the use of technology. Even television and radio are not easily available as mediums of instruction in both rural and urban areas. Teachers of rural areas do not use emerging technology. There is

no concept of e- communication through computers/internet/ other sources. No application of emerging technology in science subjects was found.

Hanushek and Woessmann, (2015) explored that the good economic situation of the nation is possible due to the large enrolment ratio of children in schools, however it requires the quality education at specific level and awareness of all the stakeholders especially the students at 9^{th} and 10^{th} class. The technical skills of the community adherents are related to the success of a single individual of community members and in reverse effected the financial development of the nation.

Yadav, (2015) states that ICT has appeared as one of the significant characteristics of present social life. School activities also have been affected by ICT including timetable, lesson plan delivery, administration, admission, evaluation, examination system and project work etc. Teaching learning process can make more relevant for students through the integration of ICT in education system.

Yadav, 2015 observed secondary school teachers (SSTs) attitude towards ICT in education system. It was found that female SSTs have strong attitude towards ICT then male SSTs. It was also revealed that public sector and urban area SSTs displayed better attitude then rural area teachers. It was described that SSTs below 40 age group showed stronger attitude as compared to those above 40. It was suggested that teachers should notice ICT as the first and foremost need of teaching in the present technological world throughout the curriculum. Khan et, al. (2015) explored that the usage of ICT in classroom and overall, at schools is very compulsory. The booklets of curriculum also suggest teachers implement ICT in classrooms (Ismail et, al. 2010).

Debbagh and Jones, (2018) described that it is necessary for teachers' that they should be aware and have competence to use ICT in classroom instruction in every subject as

well as in lesson planning, assessments, and results preparation. Nowadays it is the demand of the present situation that the teachers and students can understand and usage of ICT in the whole education system. Teachers should get proper education and training to create new attractive instructional methods and techniques to implement ICT in the education system.

Shifflet and Weilbacher (2015) observed difficulties and flaws of teachers' perception and technology integration in seventh class social studies in Illinois State. The researcher interviewed the respondents and found out the relationship of beliefs and technology integration. The study suggested that teachers' belief that technology integration can promote critical thinking in students and increase learning skills, but all these are not possible without competent teachers and ICT application in teaching learning process.

2.12 Summary

This chapter highlighted the meaning and importance of secondary education in Pakistan, SSTs opinions concerning the usage of ICT in instruction and instructional competence of SSTs in the same area in detail. Furthermore, the UNESCO-ICT-CFT framework was discussed and its three approaches like TLA, KDA and KCA overlapped with the mechanisms and terms used in educational institutions. The sub parameters of the three approaches were described in point out and explained with the help of different researchers thinking level. Models of Instructional competence for teachers and the importance of continuous professional development were pointed out to adopt for better integration of technology in instruction. Factors affecting ICT use in instruction were added to enhance the importance and to remove the barriers in ICT use in classroom. At the end various research was added in literature to explain the need for and importance of ICT use in teaching process were also added. The coming chapter is regarding the methodology of research. It helps to display selected method of research work, selection and improvement of data collection tool and its process of collection for the research study.

CHAPTER 3

RESEARCH METHOD AND PROCEDURE

The literature review of instructional competence and beliefs about ICT use in teaching learning emphasized that quality education in the present competitive environment and technological world can be acquired and transformed through skilled and competent ICT teachers and standard ICT related tools and instruments at school level. The comprehensive analysis of literature further highlighted the factors affecting ICT integration in schools. Though the intrinsic and extrinsic factors also play pivotal role in ICT use in teaching. The instructional competence and beliefs of SSTs regarding the use of ICT in classroom are equally important for integration of ICT in education. The researcher wants to fully investigate the position of the above two important variables. So, a research study was planned to find out SSTs beliefs and instructional competence. ICT facilities at school level were also investigated. This chapter consists of research design and the specific methodology adopted to accomplish the purposes of the research study, population, sample selection. This chapter describes the process of development of research tools, pilot testing, validity and reliability and data collection procedure, organization of collected data and techniques used in statistics.

3.1 Research Design

Cresswell, (2014) explains research design is the specific procedure involved in the research process such as data collection, data analysis and report writing. Research design is a plan to answer a set of questions (McCombes, 2019).

Research design can be considered a complete structure of research. It is the ‘Glue’ that holds all the elements in a research study (Akhtar 2016).

Research design is a complete plan of the proposed research work that specifies the sources and type of information relevant to the research problem. In other words, we can say it is the specific strategy to reach the objectives of the study Ram, A. (2010).

The current study consists of two main variables, SST beliefs and instructional competence of ICT use in teaching. The comparison of public and private sectors SSTs regarding the use of ICT was also identified. Computer-related facilities was also checked in both sectors. Gender differences in the context of teachers' beliefs about using ICT and instructional competence of ICT were also examined.

The present study consists of philosophy of positivism and deductive approach through selecting quantitative methodology. Keeping in view the nature of study, select a descriptive type of research. Descriptive type of research provides different dimensions to the researcher that to study the topic, its theme, and various aspects so that to state better view about the study. The alternative name of the descriptive type of research is statistical research (Khan, 2016: Cresswell, 2014).

The present study also has a proper methodology, specific sample of respondents, clear objectives, appropriate tool for data collection and techniques for analysis with ethical consideration. In the present study the researcher took help from the Saunders' research design, (2016). This design comprised of information of research philosophy, approach, methodology and proper strategy, specific technique used for data collection and analysis.

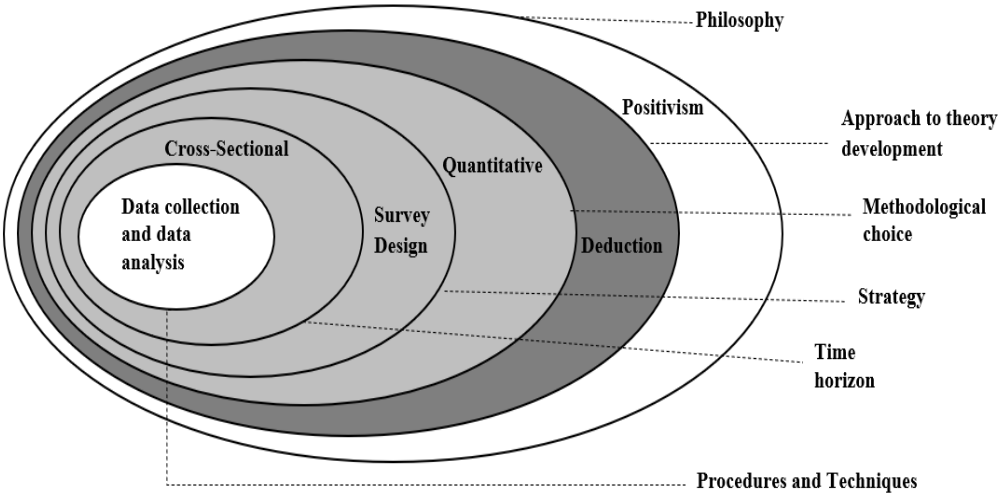


Figure 3. 1 :The Research Onion adapted from Saunders', Lewis and Thornhill (2016)

3.2 Research philosophy, approach, and methodological Choice

The choice of suitable research philosophy is an important step for doing research. In present study the Philosophy of Positivism (philosophical position that views people and human behavior in a specific way (Durkheim, 1982) and positivist approach was used with the quantitative methodology. This is because positivist believe that the nature of human behavior and society is objective and can be scientifically measured, and quantitative methods emphasize objective measurements through numbers such as statistical analysis (Durkheim, 1982: Gemma, 2018). The UNESCO ICT-CFT based adapted questionnaire was used for data collection and SSTs beliefs and instructional competence was assessed. Moreover, Quantitative, and deductive approach were connected to find out the comparison and relation of the variables by statistical analysis. In quantitative approach, the researcher used questionnaire as a tool to- gather data from the selected sample of the total population, then analyzed it statistically.

3.3 Research Strategy and Time Horizon

According to Check and Schutt, (2012, p. 160) survey research is the collection of information from a sample of individuals through their responses to questions Furthermore, survey research can use quantitative research strategy using questionnaires with numerically rated items that offers numbers in hard about opinions and behaviors of the selected sample. Decisions can be taken on the bases of these solid numbers. “Survey research is a quantitative method whereby a researcher poses some set of predetermined questions to an entire group, or a sample, of individuals” (Nardi, 2018).

A survey design was used for data collection. This research study emphases the Secondary school teachers’ beliefs and instructional competence, so quantitative approach of research was used for data collection. The researcher used a questionnaire for the required information about SSTs beliefs and instructional competence of ICT use in teaching in public and private sector of district Mardan. The questionnaire was adapted. which was based on the UNESCO ICT-CFT, (2011) framework for teachers. Cross-sectional studies can be defined as a study can be undertaken in which data are gathered just once, perhaps over a period of days or week or months, in order to answer a research question (Thomas, 2022). Cross-sectional time horizon was used during data collection. As this design enlighten the investigation of phenomenon to collect data at certain time and point.

For assuming two unlike things the null hypothesis is used. For example, difference between the variables exist or not. The difference does not happen by chance. The null hypothesis makes available a specific framework for using statistics to conclude the results and generalized the findings of the research work (Cohen, Manion

& Morrison, 2018). Based on the importance of null hypothesis the researcher framed these for achieving the objectives no 3, 4, 5 and 6.

Null hypothesis was made to find out the difference in the mean score of SSTs beliefs and instructional competence about the use ICT in teaching. Two research questions were framed for identifying the beliefs and instructional competence of SSTs at secondary level. Furthermore, the status of availability of computer-related facilities were also checked with the help of yes/no type of questions. It was ensured to the respondents that their information and identity will be kept confidential and will be used only for research purposes. The UNESCO ICT-CFT, (2011) based questionnaire was adapted for data collection. A five-point Likert scale was used for responses from the respondents of 54 items of the questionnaire. Pilot testing was conducted before data collection. Validity and reliability of research instrument was confirmed. After the conformation of suitable ranges of the questionnaire reliabilities then it was distributed for data collection.

3.4 Population of Research

All the secondary school teachers (SSTs) serving in high schools of public and private sector situated in district Mardan were the population of the research study. A group of people having some common attributes that the researcher wants to examine, identify and study is called target population (Creswell, 2008).

According to the annual statistical report of government schools of Khyber Pakhtunkhwa (ASR, 2017-2018) there are a total of 167 public high schools and 2754 Secondary School Teachers (SST) in district Mardan. Correspondingly, according to the annual statistical report of non-government schools of Khyber Pakhtunkhwa (ASR, 2017-2018), there are 130 private secondary schools and 3512 Secondary School

Teachers (SST) in district Mardan. The sector and teacher wise detail is given in the following table.

Table 3. 1 Secondary Schools in District Mardan

Sector Wise Detail of Schools and SSTs.

Sectors	Boys Schools	Girls Schools	Total Schools	Male SSTs	Female SSTs	Total SSTs
Public	87	80	167	1526	1228	2754
Private	No Specification		130	2420	1092	3512
Total			297	3946	2320	6266

Table 3.1 shows the number of boys and girls in high and higher secondary schools in District Mardan. There are 87 boys and 80 girls high schools respectively in the district in public sector while, in private sector no specification of boys and girls was found from the data but only 130 total numbers of high schools are there in private sector. The total numbers of male and female high and higher secondary in both the sectors are 297.

Equally, there are 1526 male and 1228 female SSTs in public sector while similarly, 2420 male and 1092 female SSTs are there in private sector. The total number of teachers serving as Secondary School teachers in district Mardan is 6266 which constituted the population of study.

3.5 Sample Size

It is difficult to reach every individual in the population of the study to obtain accurate results. So sampling is a better technique to save time, money, and effort. The

researcher selected those SSTs for the study who were available and willing to participate. Because participant's willingness and availability are important in research (Creswell, 2008). According to Gay, Mills and Airasian (2012) for survey research 10 to 20% of sample is representative.

3.6 Sample size selection

According to Mills and Gay (2019) if the population size is around or above 1500 then sample size should be 20% of the population size. Therefore 20% sample size was taken from each stratum. A total of 1500 questionnaires were circulated among randomly selected SSTs. 1270 questionnaires were returned. After further actions like screening 1253 were finally selected for data analysis. Survey response rate was 83%. According to Baruch and Neuman (2014) in academic research studies while using the questionnaire as a tool the response rate between 10 to 50% is considered reasonable.

The illustration is given in the following table.

Table 3. 2 Sectors wise male & female SSTs in Public & Private schools of District Mardan

Sector and Gender Wise Detail of the Selected SSTs.

Sector	Total SSTs	20%	Male SSTs Selected	Female SSTs Selected
Public	2754	550	635	618
Private	3512	703		
Total	6266	1253	1253	

Table 3.2 illustrates the sample size of sector and gender wise SSTs. In the public sector 550 SSTs (20 % of 2754) were selected randomly. Similarly, in the private sector 703 (20% 0f 3512) were selected randomly. In these selected 1253 SSTs 635 were male while 618 were female.

3.7 Sampling technique

For sample selection of the study a stratified proportionate random sampling technique was used. As the population of the study consisted of strata's; public and private; male and female, therefore the researcher adopted stratified random sampling technique. The population of the study had two strata Public and private and male and female were the sub strata. As the number of schools and teachers were not the same in each stratum therefore proportionate stratified random sampling technique was used. For this, the data of public sector SSTs were taken from the District Education Office (EMIS branch) and private sector from the Annual Statistical Report of non-government schools of Khyber Pakhtunkhwa (ASR, 2017-2018). The data consisted of their names, father names, school address, contact numbers and email addresses. Personal data of the SSTs were kept in a safe place and were devastated after overall

use in research. All the data of SSTs were put into MS Excel version 10 for random selection.

3.8 Research instrument

In current study it was planned to find out the SSTs beliefs and instructional competence of ICT use at secondary level. Furthermore, computer related facilities were also checked in secondary schools of both public and private sector of district Mardan (Pakistan). As the study followed quantitative research paradigm. The researcher selected a questionnaire as a tool for data collection because of the following reasons:

1. Time shortage
2. Feasibility
3. Openness
4. Flexibility

Ekinci, (2015) explored that the term instrument is alternatively used for questionnaire and a direct source to collect info from large number of populations. It is very helpful to collect data about different types of attitudes, behaviors and many more facts that is required in the study. However, development of valid and reliable questionnaires is very necessary for reducing error in measurements. Comparatively it is not as expensive than other tools. Furthermore, its process of development, organization and analyzation is easy. Data was collected regarding the opinions ‘of SSTs through the UNESCO ICT-CFT based adapted questionnaire.

3.8.1 Adaptation of Questionnaire for Research Study

The study is having a quantitative research approach, so for data collection a questionnaire was used. According to Neuman, (1997) there are some principles for the formation of questionnaires. These are as follows:

1. Questions should be in sequence and relevant.
2. Choices should be very easy and understandable.
3. Language should be local and comprehensible.
4. Questions should be grammatically correct.
5. Key words should be properly explained.
6. In each question one thing should be asked.

The above guidelines helped the researcher in questionnaire formation process to catch the attention of the respondent for better results and good response.

For gathering information from the SSTs, the United Nation Education Scientific and Culture Organization, Information and Communication Technology, Competency Framework for Teacher (UNESCO ICT-CFT), (2011) standard-based questionnaire was adapted which is attached at the end of the thesis (Appendix-A). The adapted questionnaire was modified according to the nature of the study and local needs with the help of expert opinions and supervisor. Furthermore, for prior permission of the adaptation of the questionnaire, the researcher tried through e-mail but found no response then the researcher personally visited the relevant UNESCO office situated in Islamabad. It was cleared that it is an open document and can be used for research purposes. To grasp the questionnaire, pilot study was directed before final data collection to measure the reliability and validity of the tool. After confirmation of the suitable ranges of reliability, the tool was used for final data collection. As it was quantitative research so, questionnaire was found helpful for this purpose in current study. So, the UNESCO ICT-CFT based adapted questionnaire was used for final data collection in the context of the present study.

3.8.2 Elements of the Adapted Instrument

A questionnaire for secondary school teachers was adapted from (UNESCO ICT-CFT), (2011) to get information about SSTs belief and instructional competence regarding ICT in the selected sample is attached (see Appendix-A) at the end of the thesis. Questionnaires are the most convenient and popular means of collecting climate data. It is also helpful in searching the opinions of the respondents (Koul, 1993). The questionnaire of the present study was consisted of 65 questions, having four parts: The detail is given below:

Part 1: It consists of the demographic data of the respondents. It covered the following areas:

1. Name
2. Age
3. Sector Public/Private
4. Experience
5. Qualification
6. Subject teaching in school
7. Rural status of the respondent
8. Urban status of the concerned secondary school teachers etc.

Part 2 It contained three main variables and their sub parts/indicators.

i. Technology literacy approach (TLA)
ii. Knowledge deepening approach (KDA)
iii. Knowledge creation approach (KCA)

Separately every approach was crossed with six educational components to describe the SSTs instructional competence and beliefs of ICT use in teaching.

The elements are stated here one by one. Understanding ICT in education, curriculum and assessment, pedagogy, ICT, Organization and administration and teacher professional learning.

Each six components of three main variables having three questions. According to this calculation each main variable having 18 sub questions and overall having 54 questions in this part.

Part 3 There are nine supply type questions regarding the use and accessibility of ICT possessions in home as well as in school of the respondents.

Part 4 There are two open ended questions regarding personal opinions of the respondent regarding availability of facilities and further suggestions for the application and awareness of the ICT in secondary schools. These questions checked the SSTs belief and availability of facilities and further suggestions for the application and awareness of the ICT use in secondary schools of the District regarding ICT usage in teaching methods.

3.8.3 Preparing Urdu version of the Questionnaire.

The questionnaire was in English version. Latter it was translated into Urdu version because in pilot testing data collection some teachers were feeling inconveniency to fill the questionnaire in English language. Some higher secondary schools of public sector were in rural areas of District Mardan having Urdu medium, so for few teachers it was difficult to understand. Respected supervisor also suggested that to translate the questionnaire in Urdu language. The Urdu version of the questionnaire validity was confirmed by the committee of Urdu language instructors (validity certificate is attached at the end of the thesis). These Professors were having compact contextual base and experience of Urdu translation from English language. Some changes were carried out by the researcher before printing, which was suggested by the expert

committee members. The Urdu version of the questionnaire is attached (as Appendix - B) at the end of the thesis.

3.8.4 Demographic Information

Respondents and their responses are very important for compression of opinions and analysis therefore seven demographic variables were added in the first part of the questionnaire. The following information ware sort out by those questions.

1. Gender
2. School status
3. Age
4. Job experience
5. Subject matter
6. Qualification
7. Area status

3.8.5 Questionnaire for SSTs (Appendix-A) Detail and Coding

Major areas of the study which were assess in the study are given below:

1) Instructional competence of SSTs in using ICT in teaching.
2) SSTs beliefs about the importance of teaching in using ICT.

Coding of the SSTs Questionnaire

Sr. #	Areas of Study	Representative Items
1	Secondary School Teachers'(SST) Instructional Competence (IC)	TLACA1, TLACA2, TLACA3, TLACP3, TLAICT1, TLAICT2, TLAICT3, TLAOA1, TLAOA2, TLAOA3, TLATPL1, TLATPL2, KDAPU2, KDAPU3, KDACA1, KDACA2, KDAP1, KDAP2, KDAP3, KDAOA1, KCACA2, KCACA3, KCAP1, kCAP2, KCAICT1, KCAICT3, KCAOA1, KCATPL3, KDAICT1, KDAICT2, KDAICT3.
2	Secondary School Teachers'(SST) Belief (B)	TLAPA1, TLAPA2, TLAPA3, TLAP1, TLAP2, TLATPL3, KDAPU1, KDACA3, KDAOA2, KDATPL1, KDAOA3, KDATPL2, KDATPL3, KCAPI1, KCAPI2, KCAPI3, KCACA1, KCAP3, KCAICT2, KCAOA2, KCAOA3, KCaTPL1, KCATPL2.
	Total Items	31+23=54

Table3.3 shows the detail of item representation to both SSTs teachers' instructional competencies and their beliefs about ICT.

As we have three main competencies namely Technology literacy approach (TLA), Knowledge deepening approach (KDA)and Knowledge creation approach (KCA) each have six components. Item representation to each competency and sub competency is given in the following table.

Table 3. 3 Competency Standards Representative Items of the Questionnaire Coding

Technology literacy approach (TLA)		Items
1	Policy Awareness (PA)	TLAPA1, TLAPA2, TLA PA3
2	Curriculum and Assessment (CA)	TLACA1, TLACA2, TLACA3
3	Pedagogy (P)	TLAP1, TLA P2, TLA P3
4	Information and Communication technology (ICT)	TLAICT1, TLA ICT2, TLA ICT3
5	Organization and Administration (OA)	TLAOA1, TLAOA2, TLAOA3
6	Teacher Professional Learning (TPL)	TLATPL1, TLATPL2, TLATPL3
Knowledge deepening approach (KDA)		
1	Policy Understanding (PU)	KDAPU1, KDAPU2, KDAPU3
2	Curriculum and Assessment (CA)	KDACA1, KDACA2, KDACA3
3	Pedagogy (P)	KDAP1, KDAP2, KDAP3
4	Information and Communication Technology (ICT)	KDAICT1, KDAICT2, KDAICT3
5	Organization and Administration (OA)	KDAOA1, KDAOA2, KDAOA3
6	Teacher Professional Learning (TPL)	KDATPL1, KDATPL2, KDATPL3
Knowledge creation approach (KCA)		
1	Policy Innovation (PI)	KCAPI1, KCAPI2, KCAPI3
2	Curriculum and Assessment (CA)	KCACA1, KCACA2, KCACA3
3	Pedagogy (P)	KCAP1, KCAP2, KCAP3
4	Information and Communication Technology (ICT)	KCAICT1, KCAICT2, KCAICT3
5	Organization and Administration (OA)	KCAOA1, KCAOA2, KCAOA3
6	Teacher Professional Learning (TPL)	KCATPL1, KCATPL2, KCATPL3

3.9 Validity of the Instrument

The development of questionnaire organization is very important for appropriate data collection for the study. If systematic procedure was not applied than the remaining steps such as pilot testing, evaluation of the procedure and procedure of data analysis may affect the importance of research work (Etikan & Bala, 2017; Esposito, 2002). The questionnaire's validity was confirmed by the opinion of experts.

Best and Khan, (1999) state that a committee of experts could ensure the content validity of the data gathering tool/questionnaire. For fulfillment of this need experts from the field of education were consulted for questionnaire validity. The panel members were experienced educators. The researcher personally held meetings with these members and thoroughly discussed the questionnaire. The panel suggested some minor changes in the content of the questionnaire which the researcher has incorporated with the consultation of supervisor. Certificates of validity of the questionnaire are attached at the end (Appendix - C). After the appreciation of the panel members the adapted questionnaire was administered for data collection from the selected sample. Afterwards reliability of the tool was directed to check the consistency of the questionnaire.

3.10 Pilot Testing

According to Cadete, (2017) pilot testing is a pathway that provides information about research planes that is it feasible or some changes in the research components are necessary. The minor description of full study is called pilot testing. It collects information about the research objectives for getting efficiency before the whole research. The following components were checked during pilot study:

a. Demographic variables
b. Questionnaire items appropriateness
c. Language accuracy
d. Translation of questionnaire in Urdu
e. Competence of questionnaire were checked as study instrument.
f. Checked the feasibility of full study with adapted questionnaire.
g. Decide resources for complete study.
h. A valid questionnaire was developed for achieving the objectives of the study.

Pilot testing was directed to check the reliability and validity of the adapted instrument. For this purpose, 100 SSTs were selected from both public and private sectors of district Mardan. These 100 teachers were not part of the final selected sample of the study. According to Saunders et.al, (2016) pilot testing brings refinement in tool and identify the difficulties faced by the respondents during questionnaire filling. Sample size for pilot testing should be between the ranges of 100-200 Dillman, (2014). Keeping in view of the Dillman suggestion, total 120 questionnaires were circulated. In which 100 were found complete and ready for insertion. With the data of 100 pilot testing was done. The researcher guided the secondary school teachers wherever they need due to the use of new terms of ICT devices. Those items of the questionnaire were modified with the help of the supervisor. During pilot study it was observed that teachers were interested in professional development using ICT in the teaching process. Teachers at the selected schools for pilot testing were approached personally.

Reliability statistics of pilot study

The data was collected form 100 SSTs in public and private sector. The reliability of the instrument was calculated which can be seen in the table.

Table 3. 4 ***Reliability of the Questionnaire***

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	No. of Items
.879	.858	63

Table 3.5 shows the overall reliability of the questionnaire which was 0.858 which shows according to (Cohen, Manion, & Morrison, 2007) highly reliable. The high reliability shows that the instrument is reliable for further use.

3.10.1 **Items wise reliability of the Questionnaire**

The item wise reliability was calculated which is given in the Table 3.4 below.

Table 3. 5 Reliability Analysis of the Questionnaire

Items	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
TLAPA2	142.90	650.990	.232	.878
TLAPA3	145.41	627.859	.528	.874
TLACA1	144.68	644.314	.409	.876
TLACA2	145.63	628.516	.627	.873
TLACA3	145.57	622.434	.706	.872
TLAP1	144.98	641.807	.422	.876
TLAP2	144.72	618.316	.593	.873
TLAP3	145.56	623.928	.670	.873
TLAICT1	145.73	629.200	.642	.873
TLAICT2	144.12	637.312	.418	.876
TLAICT3	144.71	629.846	.462	.875
TLAOA1	145.36	625.556	.616	.873
TLAOA2	145.90	661.871	.108	.879
TLAOA3	145.82	647.626	.408	.877
TLATPL1	144.75	667.167	-.037	.882
TLATPL2	144.19	634.102	.431	.876
TLATPL3	145.88	662.557	.048	.880
KDAPU1	143.30	647.028	.215	.879
KDAPU2	143.13	643.528	.291	.878
KDAPU3	143.07	645.746	.303	.877
KDACA1	144.58	632.594	.536	.874
KDACA2	144.53	639.367	.442	.876
KDACA3	143.55	654.616	.148	.880
KDAP1	145.55	657.325	.137	.879
KDAP2	145.47	653.661	.194	.879
KDAP3	145.14	635.636	.515	.875

Items	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
KDAOA1	145.58	658.598	.098	.880
KDAOA2	145.19	628.385	.521	.874
KDATPL1	144.76	617.954	.669	.872
KDATPL2	145.63	635.802	.488	.875
KCAPI1	143.25	655.534	.114	.881
KCAPI2	143.59	638.792	.361	.877
KCAPI3	143.13	637.075	.401	.876
KCACA1	143.99	645.594	.282	.878
KCACA2	144.40	627.045	.544	.874
KCACA3	144.76	631.741	.498	.875
KCAP1	145.56	661.969	.058	.880
KCAP2	145.06	655.115	.143	.880
KCAP3	143.11	655.586	.124	.880
KCAICT1	145.47	659.392	.081	.880
KCAICT2	145.22	641.471	.325	.877
KCAICT3	144.47	647.281	.176	.880
KCAOA1	145.09	623.229	.515	.874
KCAOA2	145.67	661.908	.051	.881
KCAOA3	145.16	629.688	.517	.874
KCATPL1	144.80	633.109	.505	.875
KCATPL2	144.87	640.953	.437	.876
KCATPL3	144.98	637.223	.335	.877
TLAPA1	145.69	653.732	.275	.878
KDAICT1	145.79	636.747	.498	.875
KDAICT2	146.01	656.730	.228	.878
KDAOA3	145.99	660.614	.131	.879
KDAICT3	144.12	657.772	.063	.882
KDATPL3	144.13	652.903	.119	.881
Q1	146.01	666.501	-.019	.880

Items	Scale Mean if Item Deleted	Scale Variance if Item Deleted	Corrected Item-Total Correlation	Cronbach's Alpha if Item Deleted
Q2	145.61	672.984	-.281	.881
Q3	145.56	674.270	-.348	.881
Q4	146.04	666.774	-.031	.880
Q5	145.97	666.416	-.016	.880
Q6	145.60	672.493	-.239	.881
Q7	145.73	672.774	-.261	.881
Q8	146.15	668.508	-.109	.880
Q9	145.87	666.213	-.009	.880

Table 3.4 shows that each item in the questionnaire has a high reliability coefficient. That is why no item was deleted.

3.11 Permission of Using Research Instrument

The UNESCO ICT-CFT, (2011) based questionnaire was adapted for data collection. Permission to use the adapted questionnaire was obtained through email. A copy of the email is added (as Appendix – C) at the end of thesis.

3.12 Organization of the Research Instrument

After pilot study it was ensured that the questionnaire had excellent value of reliability and validity for the present study. Then the final shape was given to the tool.

3.12.1 Coding of Scale for Analysis

The responses of the SSTs were noted by a five-point Like rt scale ranging between 1-5. Never, rarely, frequently, I have no idea and always were used for receiving responses from different items of the tool. The questionnaire was scored as following:

Description	Score
Never	1
Rarely	2

Frequently	3
I have no idea	4
Always	5

3.13 Data Collection Procedure

Data collection from the respondents (SSTs) were based upon the two main variables, Secondary School Teachers (SSTs) beliefs and SSTs instructional competence in using ICT in teaching learning process. UNESCO ICT-CFT, (2011) based adapted questionnaire (Appendix-A) was used for data collection. It consists of three approaches like TLA, KDA and KCA. These three approaches were crossed with six educational components such as, Understanding ICT in education, Curriculum and assessment, Pedagogy, ICT, Organization and administration, Teacher professional learning. Based on these components SSTs beliefs and instructional competence level were found out. Data were collected through adapted questionnaire (Appendix-A) of UNESCO ICT-CFT, (2011) from male/female and public and private SSTs of the District Mardan, KPK, Pakistan. All the participants were first contacted telephonically to get permission from them and to explain the purposes of the study. Three sources like wattsapp, email and post were used for data collection to faraway respondents while nearest respondents were visited personally by the researcher. Some of them demanded the Urdu version of the questionnaire (Appendix - B) which was provided.

A total of 1500 questionnaires were circulated among randomly selected SSTs. 1270 questionnaires were returned. After further actions like screening 1253 were finally selected for data analysis. Survey response rate was 83%. According to Baruch and Neuman (2014) in academic research studies while using the questionnaire as a tool the response rate between 10 to 50% is considered reasonable.

According to Jovancic, (2019) Purposes of data collection are as follows:

1. To facilitate you to learn about your respondents.
2. To identify new styles about how individual change their beliefs and manners with time and environment.
3. To assist the researcher in group making based on respondent needs.
4. Data collection helps in decision making.
5. It can solve problems and issues.

3.14 Statistical Tests

Decision of statistical tests was based on research objectives and hypothesis. For data analysis and interpretation, the following inferential and statistical techniques were used. Cronbach's Alpha, percentage, average, mean, standard deviation, and t-test.

3.15 Component Wise Reliability of the Questionnaire

The instrument has two main components namely SSTs beliefs, and instructional competence. The reliability component of each is as

Table 3. 6 Secondary school Teachers' beliefs and Instructional Competence about ICT Use in Instruction

Variable	Cronbach's Alpha	No. of Items
SSTs beliefs about ICT use	0.809	23
SSTs instructional competence about ICT use	0.832	31

Table 3.7 showed the reliability of the beliefs and instructional competence of SSTs component which was 0.809 & 0.832 which shows according to (Cohen, Manion, & Morrison, 2007) highly reliable.

Table 3. 8 The Reliability of the Three Approaches

Approaches	Cronbach's Alpha	No. of Items
Technology literacy approach	0.859	18
Knowledge deepening approach	0.719	18
Knowledge creation approach	0.735	18

Table 3.8 indicates the reliability in the components of technology literacy, knowledge deepening and knowledge creation approaches which is 0.859, 0.719 & 0.735 shows according to (Cohen, Manion, & Morrison, 2007) highly reliability.

3.15.1 Overall Reliability Analysis of the Instrument after Data Collection

Table 3.9 Reliability Statistics of the questionnaire

Cronbach's Alpha	Cronbach's Alpha Based on Standardized Items	No. of Items
.948	.858	63

Table 3.9 displays the Cronbach's Alpha value of the instrument that was 0.948. The Cronbach's Alpha value ranged from 0 to 1. 0.70 to 0.80 was acceptable in research. The value lower than 0.7 shows unreliability of the instrument. According to Jasper F, (2010) the Cronbach's Alpha value is the extant to measure the uniformity and internal reliability of the instrument. Cronbach's Alpha was carried out for analyzing reliability of the questionnaire.

3.16 Descriptive Statistics

Descriptive statistics in the present study comprised of frequency, mean, SD and percentage. Descriptive statistics were used for the analysis of demographic

variables. It consists of frequency and its maximum and minimum values, mean, standard deviation and percentage.

3.16.2 Inferential Statistics

In current study inferential statistics consist of t-tests. Inferential statistics were applied for testing the null hypothesis of the study, which consists of t-test, mean, percentage. 0.05 level of significant was used for the rejection and acceptance of null hypothesis.

3.17 Analysis of Data

SPSS software program was used for analysis. Before analysis some key points were kept in view. These are as follows:

a. Comprehensiveness
b. Accuracy
c. Consistency

It was observed that all questions were responded to by the respondents. It was checked that teachers answered accurately, especially in the case of rural area schools. It was also tried to check that SSTs were maintaining regularity in answering the questions. The researcher follows the above procedure to ensure the validity of records through data processing. All the information about the variables were recorded like, total score, mean, percentage, frequency, sector, gender. Tables were made for representation of the required information of the respondents. Graphs were also made for the easy representation of the study.

Table 3. 70 Brief Alignment in Research Objectives, Hypothesis with Data Analysis

Objectives	Research hypothesis /Questions	Statistical treatment
Objectives 1 To Assess secondary school teachers Beliefs about the use of computer technology in teaching.	**R. Question 1** What do secondary school teachers think about the use of computer technology in teaching?	Percentage
Objectives 2 To determine secondary school teachers' instructional competence in using information and communication technology.	**R. Question 2** What are secondary school teachers' instructional competence in using ICT in teaching?	Percentage
Objectives 3 To compare secondary school teachers' beliefs about use of ICT in teaching in public and private sector schools.	H_{03} there is no significant difference in the mean score of public and private sector secondary school teachers' beliefs regarding the use of computer technology in teaching.	t-test
Objectives 4 To compare public and private sector secondary school teachers' instructional competence in using ICT in teaching.	H_{04}(a), H_{04}(b), H_{04}(c), H_{04}(d), H_{04}(e), H_{04}(f), H_{04}(g), H_{04}(h), H_{04}(i), H_{04}(j), H_{04}(k), H_{04}(l), H_{04}(m), H_{04}(n), H_{04}(o), H_{04}(p), H_{04}(q), H_{04}(r), H_{04}(s), H_{04}(t), H_{04}(u), H_{04}(v)	t-test
Objectives 5 To compare gender differences regarding instructional competence in using ICT in teaching.	H_{05} there is no significant difference in the mean score of male and female secondary school	t-test

	teachers' instructional competence in using ICT.	
Objectives 6 To determine gender differences in secondary school teacher beliefs about the use of computer technology in teaching.	H_{06} there is no significant difference in the mean score of male and female secondary school teachers' beliefs about using ICT technology in teaching	t-test
Objectives 7 To explore the status of availability of computer related facilities in public and private sectors schools.	H_{07} there is no significant difference in the mean score of the status of availability of computer related facilities in public and private sector secondary schools.	Percentage

3.18 Research Ethics

Research ethics are always expected from the researcher to follow in research. For the implementation of this the researcher tried their best to follow that. It is the duty of the researcher to think about the ethical responsibility of human subjects like to protect their rights and to work for their welfare. The researcher struggles at the highest degree to provide protection to all the participants of the study. Institutional Review Board (IRB) process was followed by the researcher before data collection and all the required information were provided to the respondents about every item of the questionnaire, timeline and expected time of filling the questionnaire. It was said that the data may be circulated and published but confidentiality will be persisting on top priority bases.

Permission of the participants were obtained from their respective heads. The willingness and respect of the teachers was also kept in mind. Confidence was also granted to participants to keep the data in a safe locker and will be damaged after use

in research work. No name was mentioned on the questionnaire that their identity could not disclosed and to get more authentic responses from the respondents. Each questionnaire was given a specific identity code for tracing back in case of any relevant enquiry or information for the study. After that all data were loaded in SSPSS with the help of given coding.

3.19 Summary

The present chapter presented info about research design, methodology and procedure of the whole research work. It defined sample size and data collection instrument and procedure. It also defined the validity and reliability of the instrument with the help of pilot testing procedure and experts' opinion about the data collection tools. This chapter also portrayed the method of data collection. Data analysis statistics are also a part of this chapter. Data analysis procedure will be described in the coming section.

CHAPTER 4

ANALYSIS AND INTERPRETATIONS

The ongoing chapter plans for the analysis, consequences and clarification of the gathered figures and numbers. Keeping in view of the findings of the pilot study, the research tool was confirmed. Then data were collected through Instrument {adapted questionnaire of UNESCO ICT-CFT based} for the secondary school teachers in district Mardan to assess their beliefs and proficiencies in using (ICT).

The collected data were organized and analyzed by descriptive statistics like frequencies, percentages, means scores and standard deviations. After the descriptive analysis the data were analyzed through inferential statistics like independent sample t-test for gender, public and private school comparisons as independent sample t test enabled the researcher to measure the significant difference. The difference of significance was reported at the level of 0.05. Percentage and frequency were created for every item of the questionnaire. Diverse statistical methods were used for data analysis and presentation in the form of graphs and tables. SPSS version 21 software was used for data analysis. To find out the differences in opinions of SSTs regarding ICT beliefs and instructional competence of ICT used t-test and ANOVA for analysis of data. The present chapter has been divided into the following parts. These are as under:

Part 1: Respondents Demographic Information

Part 2: Descriptive statistics

Part 3: Interrelationship between Components of the Questionnaire

Part 4: Testing of null hypothesis

Descriptive statistics deal with the gender of public and private sector school inferential statistics deals with the testing of null hypotheses of the study.

4.1 P**art 1: Demographic qualities of SSTs**

Table 4. 1 ***Gender Wise Number of Respondents***

Gender wise number of respondents		
Gender	Frequency	Percentage
Male	635	50.6
Female	618	49.3
Total	1253	100

Table 4.1 indicates that the sample consist of 1253 SSTs in which 635 are male SSTs and 618 are female SSTs. The graph also showing the data distribution of respondents.

Gender Wise Distribution of Respondents

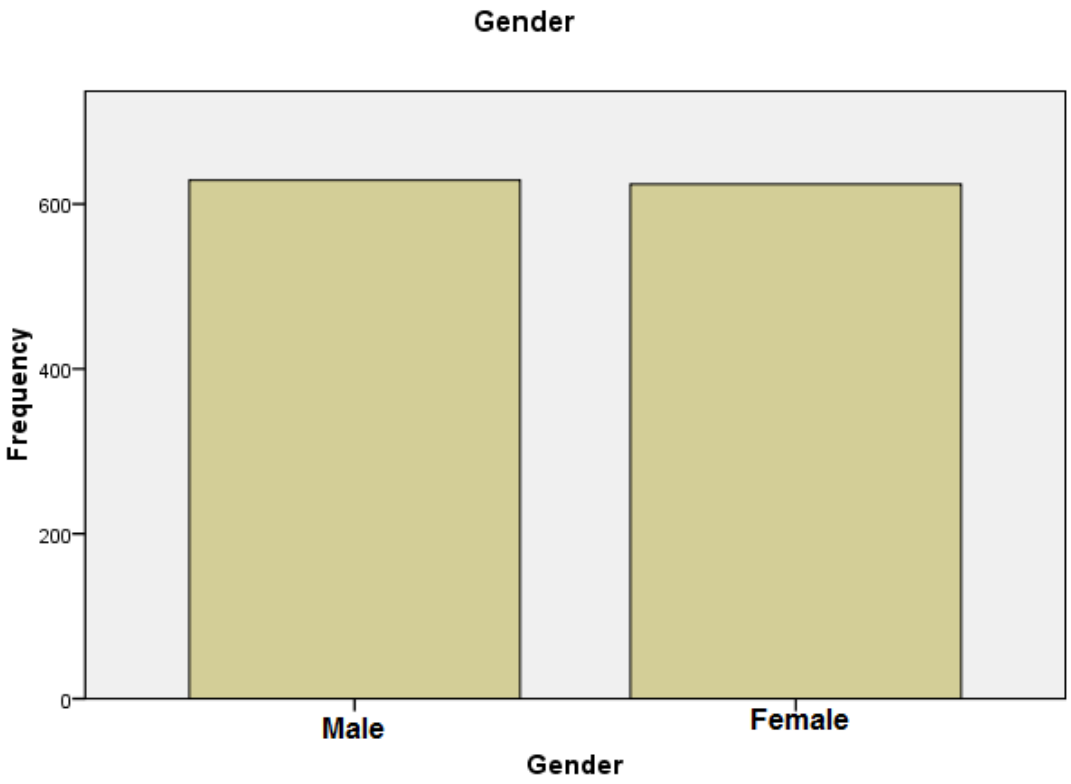


Figure 4. 1 The Gender Wise Distribution of the Respondents.

Figure 11 shows the gender wise distribution of the respondents. Total respondents are 1253 in which 635 are male SSTs and 618 are female SSTs.

Table 4. 2 Sector Wise Distribution of Respondents in Public and Private

Sector	Frequency	Percentage
Private SSTs	703	56
Public SSTs	550	44
Total	1253	100

Table 4.2 depicts that there is total 1253 SSTs in which 703 are from private sector and 550 are from public sector. The percentage of private SSTs is 56% and public SSTs is 44%. Data is also distributed on graph.

Sector Wise Distribution of Respondents

Figure 4. 2 Sector wise distribution of respondents

Figure 4.2 indicated the distribution of private and public sector SSTs. 703 SSTs are from private sector and 550 SSTs are from public sector. Total number of respondents are 1253.

4.3 Inter scale Correlation of the questionnaire items.

Table 4. 3 Correlation among Components of the Questionnaire

Components of Education System	Technology Literacy	Knowledge Deepening	Knowledge Creation
Understanding ICT in Education	.382**	.453**	.417**
Curriculum and Assessment	.683**	.578**	.696**
Pedagogy	.690**	.776**	.621**
ICT	.704**	.624**	.733**
Organization and Administration	.569**	.675**	.444**
Teacher Professional Learning	.759**	.617**	.732**

**. Correlation is significant at the 0.01 level (2-tailed).

Table 4.3 shows the correlation among different components of the questionnaire. All the components have high correlation coefficients except Understanding ICT in Education and Technology Literacy components having low correlation coefficient 0.382. Similarly, the correlation between Understanding ICT in Education and Knowledge Deepening, Understanding ICT in Education and Knowledge Creation Organization and Administration and Knowledge Creation has moderate correlation. All the correlations were significant.

4.4 Part 2: Descriptive Statistics

Research Question No 1: What do Secondary School Teachers (SSTs) think about the use of computer technology in teaching?

Responses of SSTs beliefs about the use of ICT in teaching

Table 4. 4 Responses on Teacher' beliefs About the Use of Computer Technology in Teaching

Statement	Never %	Rarely %	Frequently %	No Idea %	Always %	Mean
ICTs can support student-centered learning.	0.9	15.2	5.3	0.2	78.5	4.40
ICTs has limited capacity to provide benefits in the classroom	63.9	11.8	9.7	3.1	3.1	1.86
Use of ICT resources in Teaching	31.4	18.7	42.2	3.2	4.5	2.31
Sharing experience of ICT with other teachers	36..3	19.9	15.3	6.2	22.3	2.58
Do you teach some courses online?	82.6	6.5	3.4	1.3	6.2	1.42
ICTs could change the school environment	12.0	13.8	4.4	2.4	67.4	4.00
Do you help your students in how to apply learnt knowledge?	4.5	18.0	19.4	13.4	44.8	3.76
Creating learning environment through project based activities	54.9	9.8	11.3	18.4	5.6	2.10
Sharing ICT recourse with your colleagues	35.7	8.7	34.4	18.1	13.2	2.54

Statement	Never %	Rarely %	Frequently %	No Idea %	Always %	Mean
collaboration with ICT experts outside school	68.9	12.8	9.9	1.2	7.3	1.65
Contributing the ICT policy in the school?	11.7	11.0	4.9	7.2	65.2	4.03
Contributing the discussion of policy for introducing ICTs in the school	10.3	13.6	15.4	16.4	44.2	3.71
Introduction of ICT policy can change the teaching methods	2.4	21.5	3.8	0.2	72.0	4.18
Intentionally ICTs can be used to improve students' communication skill?	10.1	17.1	31.1	13.3	28.1	3.32
Using ICT for educating students?	9.4	9.7	5.1	7.2	68.4	4.16
Use of media for students learning	52.0	18.4	12.0	5.0	12.4	2.03
Do you collaborative projects with other schools?	74.0	5.4	5.4	13.9	1.1	1.63
Using web to collaborate with your colleagues	53.0	4.5	23.2	13.6	5.6	2.14
Do you play a key role in introducing ICTs in your school?	29.8	15.7	34.5	12.5	7.4	2.52

Statement	Never %	Rarely %	Frequently %	No Idea %	Always %	Mean
Do your colleagues consult with you to introduce ICTs in their own teaching?	24.3	24.7	39.8	5.7	5.6	2.44

Table 4.4 illustrated the beliefs of SSTs about the use of computer technology in teaching. Consequences shows that 78.5% of the secondary teachers have the opinion that the ICT can support student centered learning with a mean 4.40. 63.0% of the secondary teachers never provided benefits in the classroom through ICT with a mean 1.86. 42.2% of the secondary teachers frequently use ICT in teaching while 31.4% of the SSTs never used ICT for teaching purposes with a mean 2.31. 36.3% of secondary teachers never share their ICT experiences with other teachers with a mean 2.58 while 22.3% shares. Similarly, the percentage of teachers who never taught some online courses is 82 with a mean 1.42. About 67.4% of secondary teachers have the belief that ICT can change the school environment with a mean 4.00. 44.8% of secondary teachers always help the students in applying learnt knowledge with a mean 3.76. A majority 54.4% of secondary school teachers never create a learning environment thorough project-based activity. Similarly, 35.7% of the respondents never share ICT resources with other teachers with a mean 2.54. In the same way 68.9% of the secondary teachers never collaborate with ICT experts outside the school with a mean 1.65. 65.2% of the secondary teachers always suggest contributing to the ICT policy in the school with a mean 4.03. Likewise, 44.2% always contributed in the discussion for introducing ICT in the school with a mean 3.71. Equally 72% of the respondents have the belief that the introduction of ICT in schools can change teaching methods with a mean 4.18. 31.1%

respondents intentionally use ICT to improve the communication skills of the students with a mean 3.32. 68.4% of the SSTs have the belief that ICT can be used for educational purposes with a mean 4.16. 52% of the teachers never use media for learning purposes with a mean 2.03.

In the same way 74% of the respondents never collaborate on projects with other schools with a mean 1.63. Identically 53% of the secondary teachers never use the web to collaborate with colleagues with a mean of 2.14. About 34.5% of the secondary teachers play a key role in introducing the ICT in school with a mean 2.52. Similarly, 39.8% of other category teachers frequently consult with SSTs to introduce ICT in their teaching with a mean of 2.44.

From the above table it is concluded that secondary school teachers have the beliefs about the ICT that it can support student-centered learning. It can change the school environment. It helps the students how to apply learnt knowledge. Similarly, they suggest contributing to the ICT policy in the school. They have the belief that by the introduction of ICT in school can change teaching methods. In the same way it can improve the communicative skills of the students. ICT can be used for educational purposes as well. In contrast, secondary teachers have the belief that they never use ICT in the classroom for students' benefits in any subject. Similarly, the majority of the secondary school teachers never use ICT for online teaching. In the same way the secondary school teachers never collaborate with ICT experts outside the school nor use media and web for students learning.

In nutshell, Research Question No 1: What do (SSTs) think about the use of computer technology in teaching? is answered that secondary school teachers have the beliefs about the ICT that it can support student-centered learning, can change the

school environment, helps the students how to apply learnt knowledge, suggest contributing the ICT policy in the school, can change teaching methods of the teachers, can improve the communicative skills of the students, can be used for educational purpose as well.

Research Question No 2: What are Secondary School Teachers (SSTs) instructional competence in using ICT in teaching?

Table 4. 5 Responses on Secondary School Teacher Instructional Competencies in Using ICT in Teaching

Statements	Never %	Rarely %	Frequently %	No Idea %	Always %	Mean
Use of ICT during teaching of your subject	16.4	21.2	53.2	1.4	7.7	2.63
Use educational software related to your subject matter	67.8	14.4	8.4	3.4	6.0	1.65
Use ICT applications to evaluate student achievement	67.3	11.3	11.5	3.6	6.4	1.71
Designing the lesson plan by incorporating ICT	64.6	16.8	8.5	2.0	8.1	1.72
Use of any software for teaching?	71.3	17.6	2.3	2.0	6.8	1.55
Use of an email address	12.1	13.5	45.9	2.2	26.3	3.17
Using a computer to maintain record of students	35.1	14.2	25.0	7.6	18.1	2.59
Using of computer lab for teaching purposes	56.6	11.0	22.8	1.2	8.4	1.94
Using ICT in the classroom for individual learning of students	71.3	21.7	5.4	0.9	0.7	1.38

Statements	Never %	Rarely %	Frequently %	No Idea %	Always %	Mean
Using ICT in the classroom for small group activities	71.1	16.5	8.5	2.3	1.6	1.47
Do you use ICT to enhance your students' performances?	21.9	23.7	40.5	3.8	10.1	2.56
Use of ICT to learn about your subject matter	19.2	10.7	39.9	3.9	26.3	3.07
Introduction of ICT in school there should be a policy at national level	8.1	12.5	4.6	3.8	70.9	4.17
Introduction of any policy for ICT in school can change teaching practice in classroom	4.0	11.5	6.9	11.7	65.9	4.24
Use of ICT in teaching to make students to understand real world problems	21.6	14.5	44.2	8.4	11.0	2.73
Using innovative ways of assessment using ICT	19.2	17.9	39.7	16.3	6.9	2.74
Use of project- based learning in classroom	60.8	18.1	7.3	12.7	1.1	1.75
Designing online materials for supporting your students	40.3	17.9	29.1	10.5	2.2	2.17
Organize computers within the classroom to support collaborative activities	70.6	5.7	2.6	19.5	0.7	1.73
organizing the classroom as a learning community	56.6	9.8	8.3	8.1	17.2	2.19
Do you participate in educating teachers during in service training?	52.5	7.9	16.4	4.9	18.2	2.28
Use of ICT to communicate with your students	78.1	10.1	3.8	0.7	7.2	1.49

Statements	Never %	Rarely %	Frequently %	No Idea %	Always %	Mean
Maintaining progress of your students using ICT tools	83.2	11.5	2.6	0.2	2.6	1.28
Use of open educational resources?	30.0	6.5	20.3	0.7	42.5	3.19

Table 4.5 shows responses on secondary school teacher competence in using ICT in teaching. About 53.2 % of the respondents frequently use ICT during teaching their subjects with a mean of 2.63. Whereas 67.8% of the respondents never use educational software related to the subject matter with a mean of 1.65. Similarly, 67.3% of the SSTs never use ICT application for evaluating their students' achievement with a mean of 1.71. In the same way, 64.6% of the SSTs never design their lesson plans by ICT with a mean of 1.72. Likewise, 71.3% of the SSTs never use any software for teaching with a mean of 1.55. However, 45.9% of the respondents frequently use email address with a mean of 3.17. The majority of SSTs do not use computers for educational purposes i.e., 35.1% never use computers for maintaining students' record purpose with a mean of 2.59 while 25% use computer for this purpose. Likewise, 56.6% of teachers never use computer labs for teaching purposes with a mean of 1.94. Teachers having 71.3 percent are those who never use ICT in classroom for separate learning of students with a mean of 1.38. Likewise, 71.1% of teachers never use ICT in the schoolroom for small group activities with a mean of 1.47. About 40.5% 0f teachers use ICT frequently for enhancing students' performance with a mean of 2.56. Similarly, 39.9% of teachers frequently use ICT for learning about subject matter with a mean of 3.07. In the same way 70.9% of the teachers are of the view that there should a policy at national level

for introduction of ICT in school with a mean of 4.17 and 65.9% are of the view that due to introduction of ICT can change the teaching practice in classroom with a mean of 4.24. About 44.2% of the teachers frequently use ICT for understanding real world problems. In the same manner, 39.7% teachers use ICT for innovative ways of assessment with a mean of 2.74. About 60.8% of teachers never use project-based learning in classroom with a mean of 1.75. Likewise, 40.3% of teachers never design online materials for supporting students with a mean of 2.17. In the same manner, 70.6% of teachers never organize computers within the class for collaborative activities with a mean of 1.73. 44.2 % frequently use of ICT in teaching to make students to understand real world problems with a mean of 2.73. 39.7 % SSTs frequently using innovative ways of assessment using ICT with a mean of 2.74. 60.8 % SSTs never use project-based learning in classroom with a mean of 1.75. Along with this 40.3%, teachers never help students in creating ICT based activities. In the same manner, 62% of the teachers are those who never used online learning environment for the support of their students 2.17. Similarly, 70.1% are of the view that we never develop online collaboration with other schools with a mean of 1.73. The percentage of the teachers who never organize the classroom as a learning community is 56.6 % with a mean of 2.19. Likewise, 52.5% of teachers never participated in in-service training with a mean of 2.28. Similarly, 78.1% never communicate with their student's using ICT with a mean of 1.49. In the same way 83.2% never use ICT for maintaining progress of the students with a mean of 1.28 while 42.5% teachers use open educational resources with a mean of 3.19.

From the table 4.5 it is concluded that the SSTs have very low competencies in using ICT; software related to the subject matter, evaluating students' achievement, designing lesson plans, maintaining students' record, computer lab for teaching

purpose, individual learning of students in classroom, small group of students, online materials to support students, problem solving skill of the students, online activities that engage students, to help the student in creating ICT based activities, online learning environment for the support of their students, online collaboration with other schools, communicate with their students and maintaining progress of the students. However, SSTs have the instructional competence in the use ICT during teaching their subjects, using email address, using ICT for understanding real world problems and using ICT for innovative ways of assessment. In nutshell, Research Question No 2: What is Secondary School Teachers (SSTs) instructional competence in using ICT in teaching? is answered that secondary school teachers have low instructional competence in using ICT in teaching.

4.5 Part 4: Testing of Null Hypothesis

Objective no.3

To compare Secondary School Teachers' beliefs about use of ICT in teaching in public and private sector schools.

Research Hypothesis H_{O3}. There is no significant difference among public and private sector secondary school teachers' (SSTs) beliefs regarding the use of computer technology in teaching.

Table 4. 6 Comparison of Public and Private Sector (SSTs) Belief Regarding the Use of Computer Technology in Teaching

Groups	N	Mean	Std	Independent sample t-test α=0.05			
				Df	M.D	T	Sig
Private	703	64.6232	8.97005				
Public	550	69.9196	14.59869	1253	-5.29635	-7.874	.000

Table 4.6 shows the comparison of the beliefs regarding the use of computer technology in teaching of public and private sector (SSTs) about ICT. The mean score of private SSTs was (M=64.6232) and public SSTs were (M=69.9196) which indicates that public sectors SSTs have better beliefs than private sector teachers. However public sector teachers have more variation (14.59869) in data than private sector teachers (8.97005). Further the mean difference between the two groups was (-k5.29635). Based on the mean difference the significant 2-tailed value (0.00) is less than the significant value (0.05). This shows that there is a significant difference among public and private sector secondary school teachers' (SSTs) belief regarding the use of computer technology in teaching.

Further the result of t value, the hypothesis "There is no significant difference among public and private sector secondary school teachers' (SSTs) belief regarding the use of computer technology in teaching" is not accepted. So, it was concluded that there is significant difference among public and private sector secondary school teachers' (SSTs) belief concerning the use of computer technology in teaching.

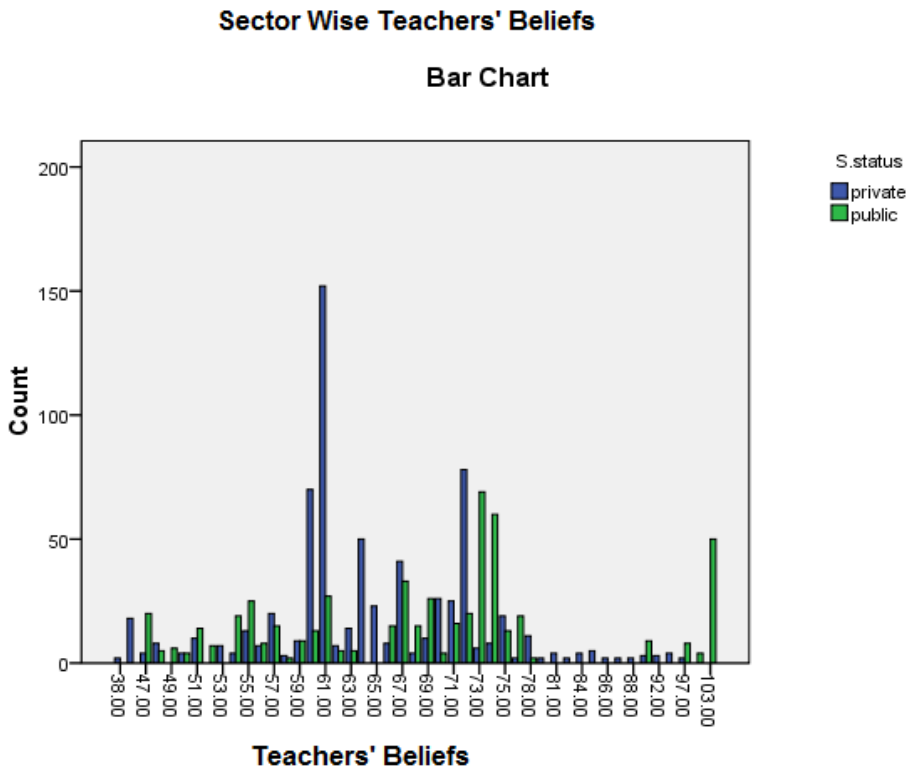


Figure 4. 3 Comparison of public and private sector SSTs belief of ICT use in teaching

Figure 4.3 indicates the comparison of public and private sector SSTs belief of ICT use in teaching. The chart shows that the public sectors SSTs have better beliefs than private sector (SSTs) teachers about the use of ICT in teaching.

Objective no.4

To compare public and private sector Secondary School Teachers' instructional competence in using information and communication technology in teaching.

Research Hypothesis H_{o4}.(a) There is no significant difference among public and private sector secondary school teachers (SSTs) instructional competence in using information and communication technology in teaching.

Table 4. 7 Comparison of Instructional Competencies of Public and Private School Secondary Teachers

Groups	N	Mean	Std	Independent sample t-test α=0.05			
				Df	M.D	T	Sig
Private	703	55.9004	11.84401				
Public	550	65.9075	14.40151	1253	-10.00712	-13.376	.000

Table 4.7 displays the comparison of instructional competencies in using ICT in teaching of the two groups. The mean score of private SSTs was (M=55.9004) while public SSTs was (M=65.9075) which indicate that public sectors SSTs have better instructional competencies in using ICT in teaching than private sector teachers. However public sector teachers have more variation (14.40151) in data than private sector teachers (11.84401). Further the mean difference between the two groups was (-10.00712). Based on the mean difference the significant 2-tailed value (0.00) is less than the significant value (0.05). This shows that there is significant difference among public and private sector secondary school teachers (SSTs) instructional competence in using ICT technology in teaching.

Further the result of t value, the hypothesis "There is no significant difference among public and private sector secondary school teachers (SSTs) instructional competence in using information and communication technology in teaching" cannot be accepted. So, it was concluded that there is significant difference among public and

private sector secondary school teachers (SSTs) instructional competence in using ICT technology in teaching.

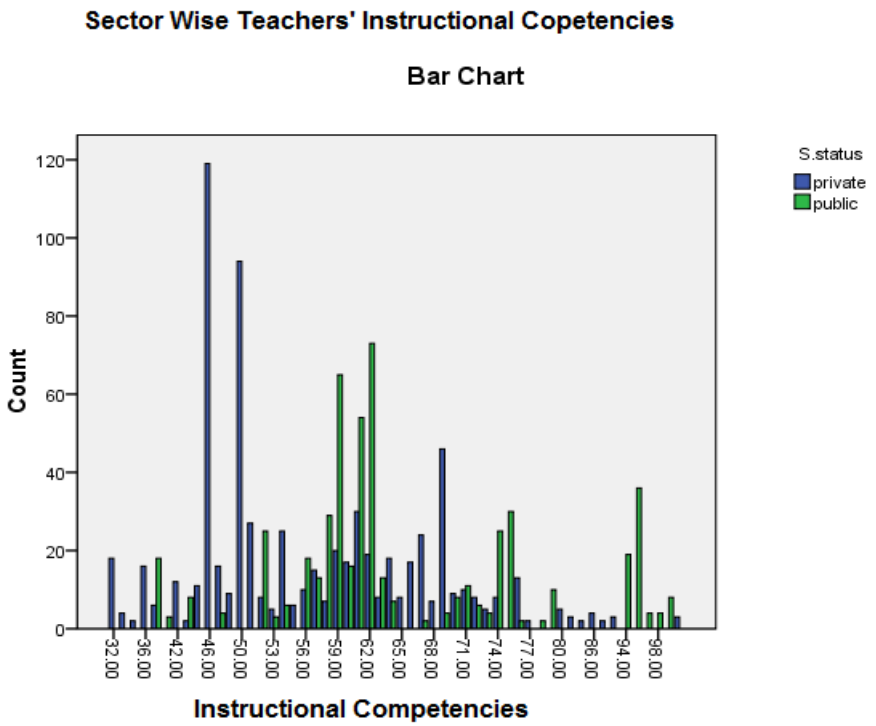


Figure 4. 4 Comparison of public and private sector SSTs instructional competence in using ICT in teaching

Figure 14 shows the comparison of public and private sector SSTs instructional competence in using ICT in teaching. It is clear from the figure that the public sectors SSTs have better instructional competence in using (ICT) in teaching than private sector (SSTs) teachers.

Research Hypothesis H_{O4} (b)

There is no significant difference among public and private sector secondary school teachers (SSTs) instructional competence in using information and communication technology in teaching in the context of technology literacy approach.

Table 4. 8 Comparison of Instructional Competencies of Public and Private School Secondary Teachers in the Context of Technology Literacy Approach

Groups	N	Mean	Std	Independent sample t-test α=0.05			
				Df	M.D	T	Sig
Private	703	36.0411	8.40312				
Public	550	44.2322	13.28605	1252	-8.19110	-13.304	.000

Table 4.8 demonstrates the comparison of instructional competencies of public and private school secondary teachers in the context of technology literacy approach. The mean score of private SSTs was (M=36.0411) while public SSTs was (M=44.2322) which indicate that public sectors SSTs have better instructional competencies in using ICT technology in teaching in the context of technology literacy approach than private sector teachers. However public sector teachers have more variation (13.28605) in data than private sector teachers (8.40312). Further the mean difference between the two groups was (-8.19110). Based on the mean difference the significant 2-tailed value (0.00) is less than the significant value (0.05). This shows that there is significant difference in the means scores of private and public sector SSTs. Further, the result of t value, the hypothesis "There is no significant difference among public and private sector secondary school teachers (SSTs) instructional competence in using ICT in teaching in the context of technology literacy approach" cannot be accepted. So, it was concluded that there is significant difference among public and private sector secondary school teachers (SSTs) instructional competence in using ICT in teaching in the context of technology literacy approach.

Research Hypothesis H_{O4} (c)

There is no significant difference among public and private sector secondary school teachers (SSTs) instructional competence in using information and communication technology in teaching in the context of policy awareness about ICT.

Table 4. 9 Comparison of instructional competencies of public and private school secondary teachers in the context of policy awareness about ICT

Groups	N	Mean	Std	Independent sample t-test α=0.05			
				Df	M.D	T	Sig
Private	703	7.7918	1.76346				
Public	550	7.9360	2.07583	1253	-.14423	-13.304	.184

Table 4.9 validates the comparison of instructional competencies of public and private school secondary teachers in the context of policy awareness about ICT. The mean scores of private sector SSTs (M=7.7918) and public sector SSTs (M=44.2322) were which indicate that public sectors SSTs have better instructional competencies in using ICT in teaching in the context of policy awareness about ICT. However public sector teachers have more variation (2.07583) in data than private sector teachers (1.76346). Further the mean difference between the two groups was (-.14423). Based on the mean difference the significant 2-tailed value (0.184) is greater than the significant value (0.05). This shows that there is no significant difference among public and private sector secondary school teachers (SSTs) instructional competence in using ICT technology in teaching in the context of policy awareness about ICT. Further the result of t value, the hypothesis “There is no significant difference among public and (SSTs) instructional competence in using ICT technology in teaching in the context of

policy awareness about ICT" can be accepted. So, it was concluded that there is no significant difference among public and private sector secondary school teachers (SSTs) instructional competences in using ICT technology in teaching in the context of policy awareness about ICT.

Research Hypothesis H_{O4} (d)

There is no significant difference among public and private sector secondary school teachers (SSTs) instructional competence in using information and communication technology in teaching in the context of basic knowledge of ICT.

Table 4. 10 Comparison of Instructional Competencies of Public and Private School Secondary Teachers in the Context of Basic Knowledge of ICT

Groups	N	Mean	Std	Independent sample t-test α=0.05			
				Df	M.D	T	Sig
Private	703	5.2635	1.98612				
Public	550	6.9269	3.38956	1253	-1.66342	-13.304	.000

Table 4.10 confirms the comparison of instructional competencies of public and private school secondary teachers in the context of basic knowledge of ICT. The mean scores of private sector SSTs (M=5.2635) and public sector SSTs (M=6.9269) were which indicate that public sectors SSTs have better instructional competencies in using ICT technology in teaching in the context of policy awareness about ICT. However public sector teachers have more variation (3.38956) in data than private sector teachers (1.98612). Further the mean difference between the two groups was -1.66342). Based on the mean difference the significant 2-tailed value (0.000) is less than the significant

value (0.05). This shows that there is significant difference among public and private sector (SSTs) instructional competence in using ICT technology in teaching in the context of basic knowledge of ICT. Further the result of t value, the hypothesis "There is no significant difference among public and private sector secondary school teachers (SSTs) instructional competence in using ICT technology in teaching in the context of basic knowledge of ICT" cannot be accepted. So, it was decided that there is significant difference among public and private sector (SSTs) instructional competence in using ICT technology in teaching in the context of basic knowledge of ICT.

Research Hypothesis H_{O4} (e)

There is no significant difference among public and private sector secondary school teachers (SSTs) instructional competence in using information and communication technology in teaching in the context of integration of technology.

Table 4. 11 Comparison of Instructional Competencies of Public and Private School Secondary Teachers in the Context of Integration of Technology

Groups	N	Mean	Std	Independent sample t-test α=0.05			
				Df	M.D	T	Sig
Private	703	5.7606	2.47729				
Public	550	7.7093	3.43671	1253	-1.94870	-11.657	.000

Table 4.11 illustrates the comparison of instructional competence in using ICT technology in teaching in the context of integration of technology of public and private sector secondary schools. The mean scores of private sector SSTs (M=5.7606) and public sector SSTs (M=7.7093) were which indicate that public sectors SSTs have

better instructional competencies in using ICT technology in teaching in the context of integration of technology. However public sector teachers have more variation (3.43671) in data than private sector teachers (2.47729). Further the mean difference between the two groups was (-1.94870). Based on the mean difference the significant 2-tailed value (0.000) is less than the significant value (0.05). This shows that there is significant difference among public and private sector secondary school teachers' (SSTs) instructional competence in using information and communication technology in teaching in the context of integration of technology.

Further the result of t value, the hypothesis "There is no significant difference among public and private sector secondary school teachers (SSTs) instructional competence in using ICT technology in teaching in the context of integration of technology" cannot be accepted. So, it was concluded that there is a significant difference among public and private sector (SSTs) instructional competence in using ICT technology in teaching in the context of integration of technology.

Research Hypothesis H_{O4} (f)

There is no significant difference among public and private sector secondary school teachers (SSTs) instructional competence in using ICT technology in teaching in the context of the use of basic tools of technology.

Table 4. 12 Comparison of Instructional Competencies of Public and Private School Secondary Teachers in the Context of the Use of Basic Tools of Technology

Groups	N	Mean	Std	Independent sample t-test α=0.05			
				Df	M.D	T	Sig
Private	703	6.4504	2.11337				
Public	550	8.4388	3.25776	1253	-1.98833	-13.055	.000

Table 4.12 explains the comparison of instructional competence in using ICT technology in teaching in the context of the use of basic tools of technology among public and private school secondary. The mean scores of private sector SSTs (M=6.4504) and public sector SSTs (M=8.4388) were which indicate that public sectors SSTs have better instructional competencies in using ICT technology in teaching in the context of integration of technology. However public sector teachers have more variation (3.25776) in data than private sector teachers (2.11337). Further the mean difference between the two groups was (-1.98833). Based on the mean difference the significant 2-tailed value (0.000) is less than the significant value (0.05). This shows that there is significant difference among public and private sector secondary school teachers (SSTs) instructional competence in using information and communication technology in teaching in the context of the use of basic tools of technology. Further the result of t value, the hypothesis "There is no significant difference among public

and private sector secondary school teachers (SSTs) instructional competence in using ICT in teaching in the context of the use of basic tools of technology" can't be accepted. So, it was concluded that there is a significant difference among public and private sector secondary school teachers (SSTs) instructional competence in using ICT technology in teaching in the context of the use of basic tools of technology.

Research Hypothesis H_{O4} (g)

There is no significant difference among public and private sector secondary school teachers (SSTs) instructional competence in using ICT technology in teaching in the context of standard classroom.

Table 4. 13 Comparison of Instructional Competencies of Public and Private School Secondary Teachers in the Context of Standard Classroom

Groups	N	Mean	Std	Independent sample t-test α=0.05			
				Df	M.D	T	Sig
Private	703	4.1459	1.97860				
Public	550	5.6124	1.88295	1253	-1.46654	-13.289	.000

Table 4.13 describes the comparison of instructional competence in using ICT technology in teaching in the context of standard classroom among public and private school secondary. The mean scores of private sector SSTs (M=5.6124) and public sector SSTs (M=4.1459) were which indicate that public sectors SSTs have better instructional competencies in using ICT technology in teaching in the context of standard classroom. However private sector teachers have more variation (1.97860) in data than public sector teachers (1.88295). Further the mean difference between the two groups was (-1.46654). Based on the mean difference the significant 2-tailed value

(0.000) is less than the significant value (0.05). This shows that there is significant difference among public and private sector (SSTs) instructional competence in using ICT technology in teaching in the context of standard classroom.

Further the result of t value, the hypothesis "There is no significant difference among public and private sector secondary school teachers (SSTs) instructional competence in using ICT technology in teaching in the context of standard classroom" cannot be accepted. So, it was concluded that there is a significant difference among public and private sector (SSTs) instructional competence in using ICT in teaching in the context of standard classroom.

Research Hypothesis H_{O4} (h)

There is no significant difference among public and private sector secondary school teachers (SSTs) instructional competence in using ICT technology in teaching in the context of digital literacy.

Table 4. 14 Comparison of instructional competencies of public and private school secondary teachers in the context of digital literacy

Groups	N	Mean	Std	Independent sample t-test α=0.05			
				Df	M.D	T	Sig
Private	703	6.6289	2.09788				
Public	550	7.6088	2.21478	1253	-.97988	-8.002	.000

Table 4.14 describes the comparison of instructional competence in using ICT in teaching in the context of digital literacy among public and private school secondary. The mean scores of private sector SSTs (M=6.6289) and public sector SSTs (M=7.6088) were which indicate that public sectors SSTs have better instructional competencies in using ICT in teaching in the context of digital literacy. However public sector teachers have more variation (2.21478) in data than private sector teachers (2.21478). Further the mean difference between the two groups was (-.97988). Based on the mean difference the significant 2-tailed value (0.000) is less than the significant value (0.05). This shows that there is significant difference among public and private sector secondary school (SSTs) instructional competence in using ICT in teaching in the context of digital literacy. Further the result of t value, the hypothesis "There is no significant difference among public and private sector (SSTs) instructional competence in using ICT in teaching in the context of digital literacy" cannot be accepted. So, it was concluded that there is a significant difference among public and private sector secondary school teachers (SSTs) instructional competence in using information and communication technology in teaching in the context of digital literacy.

Research Hypothesis H_{O4} (i)

There is no significant difference among public and private sector secondary school teachers (SSTs) instructional competence in using ICT technology in teaching in the context of knowledge deepening approach.

Table 4. 15 Comparison of instructional competencies of public and private school secondary teachers in the context of knowledge deepening approach

Groups	N	Mean	Std	Independent sample t-test α=0.05			
				Df	M.D	T	Sig
Private	703	34.8895	7.24597				
Public	550	36.9325	8.05264	1253	-2.04294	-4.683	.000

Table 4.15 presents the comparison of instructional competence in using ICT in teaching in the context of knowledge deepening approach among public and private school secondary. The mean scores of private sector SSTs (M=34.8895) and public sector SSTs (M=36.9325) were which indicate that public sectors SSTs have better instructional competencies in using ICT in teaching in the context of knowledge deepening approach. However public sector teachers have more variation (8.05264) in data than private sector teachers (7.24597). Further the mean difference between the two groups was (-2.04294). Based on the mean difference the significant 2-tailed value (0.000) is less than the significant value (0.05). This shows that there is significant difference among public and private sector secondary school teachers (SSTs) instructional competence in using ICT in teaching in the context of knowledge deepening approach. Further the result of t value, the hypothesis "There is no significant difference among public and private sector (SSTs) instructional competence

in using ICT in teaching in the context of knowledge deepening approach" cannot be accepted. So, it was concluded that there is a significant difference among public and private sector (SSTs) instructional competence in using ICT in teaching in the context of knowledge deepening approach.

Research Hypothesis H_{O4} (j)

There is no significant difference among public and private sector secondary school teachers (SSTs) instructional competence in using ICT in teaching in the context of policy understanding in ICT.

Table 4. 16 Comparison of instructional competencies of public and private school secondary teachers in the context of policy understanding in ICT

Groups	N	Mean	Std	Independent sample t-test α=0.05			
				Df	M.D	T	Sig
Private	703	12.6374	3.58981				
Public	550	12.1024	4.02971	1252	-.25945	2.480	.013

Table 4.16 exhibits the comparison of instructional competence in using ICT in teaching in the context of policy understanding in ICT among public and private sector secondary school teachers. The mean scores of private sector SSTs (M=12.6374) and public sector SSTs (M=12.1024) were which indicate that private sectors SSTs have better instructional competencies in using ICT technology in teaching in the context of policy understanding in ICT than public sector. However public sector teachers have more variation (4.02971) in data than private sector teachers (3.58981). Further the mean difference between the two groups was (-.25945). Based on the mean difference the significant 2-tailed value (0.013) is greater than the significant value (0.05). This

shows that there is no significant difference among public and private sector (SSTs) instructional competence in using ICT in teaching in the context of policy understanding in ICT. Further the result of t value, the hypothesis "There is no significant difference among public and private sector (SSTs) instructional competence in using ICT in teaching in the context of policy understanding in ICT" can be accepted. So, it was concluded that there is a no significant difference among public and private sector (SSTs) instructional competence in using ICT technology (ICT) in teaching in the context of policy understanding in ICT.

Research Hypothesis H_{O4} (k)

There is no significant difference among public and private sector secondary school teachers (SSTs) instructional competence in using ICT in teaching in the context of knowledge application.

Table 4. 17 Comparison of instructional competencies of public and private school secondary teachers in the context of knowledge application

Groups	N	Mean	Std	Independent sample t-test α=0.05			
				Df	M.D	T	Sig
Private	703	6.2394	1.70878				
Public	550	6.8373	2.12198	1253	-.59792	-5.524	.000

Table 4.17 shows the comparison of instructional competence in using ICT in teaching in the context of knowledge application among public and private sector SSTs. The mean scores of private sector SSTs (M=6.2394) and public sector SSTs (M=6.8373) were which indicate that public sectors SSTs have better instructional competencies in using ICT technology in teaching in the context of knowledge application. However public sector teachers have more variation (2.12198) in data than private sector teachers (1.70878). Further the mean difference between the two groups was (-.59792). Based on the mean difference the significant 2-tailed value (0.000) is less than the significant value (0.05). This shows that there is significant difference among public and private sector (SSTs) instructional competence in using ICT in teaching in the context of knowledge application.

Further the result of t value, the hypothesis "There is no significant difference among public and private sector (SSTs) instructional competence in using ICT in teaching in the context of knowledge application" cannot be accepted. So, it was concluded that there is a significant difference among public and private sector (SSTs) instructional competence in using ICT in teaching in the context of knowledge application.

Research Hypothesis H_{O4} (l)

There is no significant difference among public and private sector secondary school teachers (SSTs) instructional competence in using ICT in teaching in the context of complex problem solving.

Table 4. 18 Comparison of instructional competencies of public and private school secondary teachers in the context of complex problem solving

Groups	N	Mean	Std	Independent sample t-test α=0.05			
				Df	M.D	T	Sig
Private	703	5.7351	3.29226				
Public	550	5.7560	2.38352	1253	-.02084	-.125	.901

Table 4.18 demonstrates the Comparison of instructional competence in using ICT in teaching in the context of complex problem solving among public and private secondary school teachers. The mean scores of private sector SSTs (M=5.7351) and public sector SSTs (M=5.7560) were which indicate that private and public sectors SSTs have almost equal instructional competencies in using ICT technology in teaching in the context of complex problem solving. However private sector teachers have more variation (3.29226) in data than private sector teachers (2.38352). Further the mean difference between the two groups was (-.02084). Based on the mean difference the significant 2-tailed value (0.91) is greater than the significant value (0.05). This shows that there is no significant difference among public and private sector (SSTs) instructional competence in using ICT in teaching in the context of complex problem solving. Further the result of t value, the hypothesis “There is no significant difference among public and private sector (SSTs) instructional competence in using ICT in

teaching in the context of complex problem solving" can be accepted. So, it was decided that there is no significant difference among public and private sector secondary school teachers (SSTs) instructional competence in using ICT technology in teaching in the context of complex problem solving.

Research Hypothesis H_{O4} (m)

There is no significant difference among public and private sector secondary school teachers (SSTs) instructional competence in using ICT in teaching in the context of complex tools in ICT.

Table 4. 19 Comparison of instructional competencies of public and private school secondary teachers in the context of complex tools in ICT

Groups	N	Mean	Std	Independent sample t-test α=0.05			
				Df	M.D	T	Sig
Private	703	2.9037	1.51093				
Public	550	3.2967	1.67657	1253	-.39302	-4.350	.000

Table 4.19 indicates the comparison of instructional competence in using ICT in teaching in the context of complex tools in ICT among public and private sector SSTs. The mean scores of private sector SSTs (M=2.9037) and public sector SSTs (M=3.2967) were which indicate that public sectors SSTs have better instructional competencies in using ICT in teaching in the context of complex tools in ICT. However public sector teachers have more variation (1.67657) in data than private sector teachers (1.51093). Further the mean difference between the two groups was (-.39302). Based on the mean difference the significant 2-tailed value (0.000) is less than the significant value (0.05). This shows that there is significant difference among public and private

sector secondary school teachers (SSTs) instructional competence in using (ICT) in teaching in the context of complex tools in ICT. Further the result of t value, the hypothesis "There is no significant difference among public and private sector secondary school teachers (SSTs) instructional competence in using ICT in teaching in the context of complex tools in ICT" cannot be accepted. So, it was concluded that there is a significant difference among public and private sector secondary school teachers (SSTs) instructional competence in using information and communication technology in teaching in the context of complex tools in ICT.

Research Hypothesis H_{O4} (n)

There is no significant difference among public and private sector secondary school teachers (SSTs) instructional competence in using ICT in teaching in the context of collaborative groups.

Table 4. 20 Comparison of instructional competencies of public and private school secondary teachers in the context of collaborative groups

Groups	N	Mean	Std	Independent sample t-test α=0.05			
				Df	M.D	T	Sig
Private	703	3.6204	2.33149				
Public	550	4.1250	2.30425	1253	-.50460	-3.797	.000

Table 4.20 parades the comparison of instructional competence in using ICT in teaching in the context of collaborative groups among public and private sector SSTs. The mean scores of private sector SSTs (M=3.6204) and public sector SSTs (M=4.1250) were which indicate that public sectors SSTs have better instructional competencies in using ICT in teaching in the context of collaborative groups. However public sector teachers (2.30425) and private sectors (2.30425) have the same variation in data. Further the mean difference between the two groups was (-.50460). Based on the mean difference the significant 2-tailed value (0.000) is less than the significant value (0.05). This shows that there is a significant difference among public and private sector (SSTs) instructional competence in using ICT in teaching in the context of collaborative groups.

Further the result of t value, the hypothesis "There is no significant difference among public and private sector (SSTs) instructional competence in using ICT in teaching in the context of collaborative groups" cannot be accepted. So, it was concluded that there is a significant difference among public and private sector secondary school teachers (SSTs) instructional competence in using ICT in the context of collaborative groups.

Research Hypothesis H_{O4} (o)

There is no significant difference among public and private sector secondary school teachers (SSTs) instructional competence in using ICT in teaching in the context of managing and guiding in ICT.

Table 4. 21 Comparison of instructional competencies of public and private school secondary teachers in the context of managing and guiding in ICT

Groups	N	Mean	Std	Independent sample t-test α=0.05			
				Df	M.D	T	Sig
Private	703	3.7535	1.87296				
Public	550	4.7660	2.16450	1253	-1.01246	-8.863	.000

Table 4.21 directs the comparison of instructional competence in using ICT in teaching in the context of managing and guiding in ICT among public and private sector SSTs. The mean scores of private sector SSTs (M=3.7535) and public sector SSTs (M=4.7660) were which indicate that public sectors SSTs have better instructional competencies in using ICT in teaching in the context of managing and guiding in ICT. However public sector teachers have more variation (2.16450) in data than private sector teachers (1.87296). Further the mean difference between the two groups was (-1.01246). Based on the mean difference the significant 2-tailed value (0.000) is less than the significant value (0.05). This shows that there is significant difference among public and private sector secondary school teachers (SSTs) instructional competence in using ICT in teaching in the context of managing and guiding in ICT. Further the result of t value, the hypothesis "There is no significant difference among public and private sector (SSTs) instructional competence in using ICT in teaching in the context of managing and guiding in ICT" cannot be accepted. So, it was determined that there is

a significant difference among public and private sector secondary school teachers (SSTs) instructional competence in using information and communication technology in teaching in the context of managing and guiding in ICT.

Research Hypothesis H_{O4} (p)

There is no significant difference among public and private sector secondary school teachers (SSTs) instructional competence in using ICT in teaching regarding knowledge creation approach.

Table 4. 22 Comparison of instructional competencies of public and private sector SSTs in using ICT in teaching regarding knowledge creation approach

Groups	N	Mean	Std	Independent sample t-test α=0.05			
				Df	M.D	T	Sig
Private	703	55.1679	9.74085				
Public	550	60.8250	12.17147	1252	-5.65718	-9.091	.000

Table 4.22 guides the comparison of instructional competencies of public and private SSTs in using ICT in teaching regarding knowledge creation approach. The mean scores of private sector SSTs (M=55.1679) and public sector SSTs (M=60.8250) were which indicate that public sectors SSTs have better instructional competencies in using ICT in teaching regarding knowledge creation approach. However public sector teachers have more variation (12.17147) in data than private sector teachers (9.74085). Further the mean difference between the two groups was (-5.65718). Based on the mean difference the significant 2-tailed value (0.000) is less than the significant value (0.05). This shows that there is significant difference among public and private sector (SSTs) instructional competence in using ICT in teaching regarding knowledge creation

approach. Further the result of t value, the hypothesis "There is no significant difference among public and private sector (SSTs) instructional competence in using ICT in teaching regarding knowledge creation approach" cannot be accepted. So, it was concluded that there is a significant difference among public and private sector (SSTs) instructional competence in using ICT in teaching regarding knowledge creation approach.

Research Hypothesis H_{O4} (q)

There is no significant difference among public and private sector secondary school teachers (SSTs) instructional competence in using ICT in teaching in the context of policy innovation.

Table 4. 23 Comparison of instructional competencies of public and private school secondary teachers in the context of policy innovation

Groups	N	Mean	Std	Independent sample t-test α=0.05			
				Df	M.D	T	Sig
Private	703	11.8045	3.26143				
Public	550	12.0640	3.68860	1252	-.25945	-1.319	.188

K2Table 4.23 directs the comparison of instructional competence in using ICT in teaching in the context of policy innovation among public and private sector SSTs. The mean scores of private sector SSTs (M=11.8045) and public sector SSTs (M=12.0640) were which indicate that public sectors SSTs have better instructional competencies in using ICT in teaching in the context of policy innovation. However public sector teachers have more variation (3.68860) in data than private sector teachers (3.26143). Further the mean difference between the two groups was (-.25945). Based on the mean difference the significant 2-tailed value (0.188) is greater than the significant value (0.05). This shows that there is no significant difference among public and private sector (SSTs) instructional competence in using ICT in teaching in the context of policy innovation. Further the result of t value, the hypothesis "There is no significant difference among public and private sector (SSTs) instructional competence in using ICT in teaching in the context of policy innovation" can be accepted. So, it was concluded that there is a no significant difference among public and private sector (SSTs) instructional competence in using ICT in teaching in the context of policy innovation.

Research Hypothesis H_{O4} (r)

There is no significant difference among public and private sector secondary school teachers (SSTs) instructional competence in using ICT in teaching in the context of knowledge society skill.

Table 4. 24 Comparison of instructional competencies of public and private school secondary teachers in in the context of knowledge society skills

Groups	N	Mean	Std	Independent sample t-test α=0.05			
				Df	M.D	T	Sig
Private	703	7.8909	3.04589				
Public	550	9.9360	3.39758	1253	-2.04508	-11.205	.000

Table 4.24 leads the comparison of instructional competence in using ICT in teaching in the context of knowledge society skills among public and private sector SSTs. The mean scores of private sector SSTs (M=7.8909) and public sector SSTs (M=9.9360) were which indicate that public sectors SSTs have better instructional competencies in using ICT in teaching in the context of knowledge society skills. However public sector teachers have more variation (3.39758) in data than private sector teachers (3.39758). Further the mean difference between the two groups was (-2.04508). Based on the mean difference the significant 2-tailed value (0.000) is less than the significant value (0.05). This shows that there is significant difference among public and private sector (SSTs) instructional competence in using ICT in teaching in the context of knowledge society skills. Further the result of t value, the hypothesis "There is no significant difference among public and private sector (SSTs) instructional

competence in using ICT in teaching in the context of knowledge society skills" cannot be accepted. So, it was concluded that there is a significant difference among public and private sector (SSTs) instructional competence in using ICT in teaching in the context of knowledge society skills.

Research Hypothesis H_{O4} (s)

There is no significant difference among public and private sector secondary school teachers (SSTs) instructional competence in using ICT in teaching in the context of self-management.

Table 4. 25 Comparison of instructional competencies of public and private school secondary teachers in the context of self-management

Groups	N	Mean	Std	Independent sample t-test α=0.05			
				Df	M.D	T	Sig
Private	703	8.0949	2.17355				
Public	550	8.1225	2.01950	1252	-.02759	-.230	.818

Table 4.25 guides the comparison of instructional competence in using ICT in teaching in the context of self-management among public and private SSTs. The mean scores of private sector SSTs (M=8.0949) and public sector SSTs (M=8.1225) were which indicate that public sectors SSTs have little better instructional competencies in using ICT in teaching in the context of self-management. However private sector teachers have little more variation (2.17355) in data than public sector teachers (2.01950). Further the mean difference between the two groups was (-.02759). Based on the mean difference the significant 2-tailed value (0.818) is greater than the significant value (0.05). This shows that there is no significant difference among public

and private sector (SSTs) instructional competence in using ICT in teaching in the context of self-management. Further the result of t value, the hypothesis "There is no significant difference among public and private sector (SSTs) instructional competence in using ICT in teaching in the context of self-management" can be accepted. So, it was concluded that there is a no significant difference among public and private sector secondary school teachers (SSTs) instructional competence in using ICT in teaching in the context of self-management.

Research Hypothesis H_{O4} (t)

There is no significant difference among public and private sector secondary school teachers (SSTs) instructional competence in using ICT in teaching in the context the use of pervasive tools of ICT.

Table 4. 26 Comparison of instructional competencies of public and private school secondary teachers in the context the use of pervasive tools of ICT

Groups	N	Mean	Std	Independent sample t-test α=0.05			
				Df	M.D	T	Sig
Private	703	5.8819	2.88458				
Public	550	7.6998	2.57295	1252	-1.81788	-11.557	.000

Table 4.26 indicates the comparison of instructional competence in using ICT in teaching in the context the use of pervasive tools of ICT among public and private sector SSTs. The mean scores of private sector SSTs (M=5.8819) and public sector SSTs (M=7.6998) were which indicate that public sectors SSTs have better instructional competencies in using ICT in teaching in the context the use of pervasive tools of ICT. However private sector teachers have little more variation (2.88458) in

data than public sector teachers (2.57295). Further the mean difference between the two groups was (-1.81788). Based on the mean difference the significant 2-tailed value (0.000) is less than the significant value (0.05). This shows that there is significant difference among public and private sector (SSTs) instructional competence in using ICT in teaching in the context the use of pervasive tools of ICT.

Further the result of t value, the hypothesis "There is no significant difference among public and private sector (SSTs) instructional competence in using ICT in teaching in the context the use of pervasive tools of ICT" cannot be accepted. So, it was concluded that there is a significant difference among public and private sector secondary school teachers' instructional competence in using (ICT) in teaching in the context the use of pervasive tools of ICT.

Research Hypothesis H_{O4} (u)

There is no significant difference among public and private sector secondary school teachers (SSTs) instructional competence in using ICT in teaching in the context of learning organization.

Table 4. 27 Comparison of instructional competencies of public and private school secondary teachers in in the context of learning organization

Groups	N	Mean	Std	Independent sample t-test α=0.05			
				Df	M.D	T	Sig
Private	703	5.4037	3.11465				
Public	550	6.6399	3.34359	1253	-1.23614	-6.735	.000

Table 4.27 directs the comparison of instructional competence in using ICT in teaching in the context of learning organization among public and private SSTs. The mean scores of private sector SSTs (M=5.4037) and public sector SSTs (M=6.6399) were which indicate that public sectors SSTs have better instructional competencies in using ICT in teaching in the context of learning organization. However public sector teachers have little more variation (3.34359) in data than private sector teachers (3.11465). Further the mean difference between the two groups was (-1.23614). Based on the mean difference the significant 2-tailed value (0.000) is less than the significant value (0.05). This shows that there is significant difference among public and private sector (SSTs) instructional competence in using ICT in teaching in the context of learning organization. Further the result of t value, the hypothesis "There is no significant difference among public and private sector (SSTs) instructional competence in using ICT in teaching in the context of learning organization" cannot be accepted. So, it was concluded that there is a significant difference among public and private sector (SSTs) instructional competence in using ICT in teaching in the context of learning organization.

Research Hypothesis H_{O4} (v)

There is no significant difference among public and private sector secondary school teachers (SSTs) instructional competence in using ICT in teaching in the context of teacher as model learner.

Table 4. 28 Comparison of instructional competencies of public and private school secondary teachers in in the context of teacher as model learner

Groups	N	Mean	Std	Independent sample t-test α=0.05			
				Df	M.D	T	Sig
Private	703	16.0809	3.97299				
Public	550	16.3400	4.93079	1252	-1.23614	-1.030	.303

Table 4.28 directs the comparison of instructional competence in using ICT in teaching in the context of teacher as model learner among public and private sector SSTs. The mean scores of private sector SSTs (M=16.0809) and public sector SSTs (M=16.3400) were which indicate that public sectors SSTs have little better instructional competencies in using ICT in teaching in the context of teacher as model learner. However public sector teachers have little more variation (4.93079) in data than private sector teachers (3.97299). Further the mean difference between the two groups was (-1.23614). Based on the mean difference the significant 2-tailed value (0.303) is greater than the significant value (0.05). This shows that there is no significant difference among public and private sector (SSTs) instructional competence in using ICT in teaching in the context of teacher as model learner.

Further the result of t value, the hypothesis "There is no significant difference among public and private sector (SSTs) instructional competence in using ICT in teaching in the context of teacher as model learner" can be accepted. So, it was concluded that there is a no significant difference among public and private sector (SSTs) instructional competence in using ICT in teaching in the context of teacher as model learner.

Objective no. 5

To compare gender differences regarding instructional competence in using Information and communication technology in teaching.

Research Hypothesis H_{o5}

There is no significant difference among male and female (SSTs) instructional competence in using ICT technology

Table 4. 29 Comparison of instructional competencies among male and female (SSTs) in using ICT in teaching

Z	N	Mean	Std	Independent sample t-test α=0.05			
				Df	M.D	T	Sig
Male	635	62.2186	14.32745				
Female	618	58.1489	13.17433	1253	4.06971	5.189	.000

Table 4.29 parades the comparison of instructional competencies of male and female (SSTs) instructional competence in using ICT in teaching. The mean scores of male SSTs (M=62.2186) and female SSTs (M=58.1489) were which indicate that male SSTs have better instructional competence in using ICT in teaching than female. However male teachers have more variation (14.32745) in data than female teachers (13.17433). Further the mean difference between the two groups was (4.06971). Based on the mean difference the significant 2-tailed value (0.000) is less than the significant value (0.05). This shows that there is significant difference among male and female (SSTs) instructional competence in using ICT.

Further the result of t value, the hypothesis "There is no significant difference among male and female (SSTs) instructional competence in using ICT cannot be accepted. So, it was concluded that there is a significant difference among male and female (SSTs) instructional competence in using (ICT).

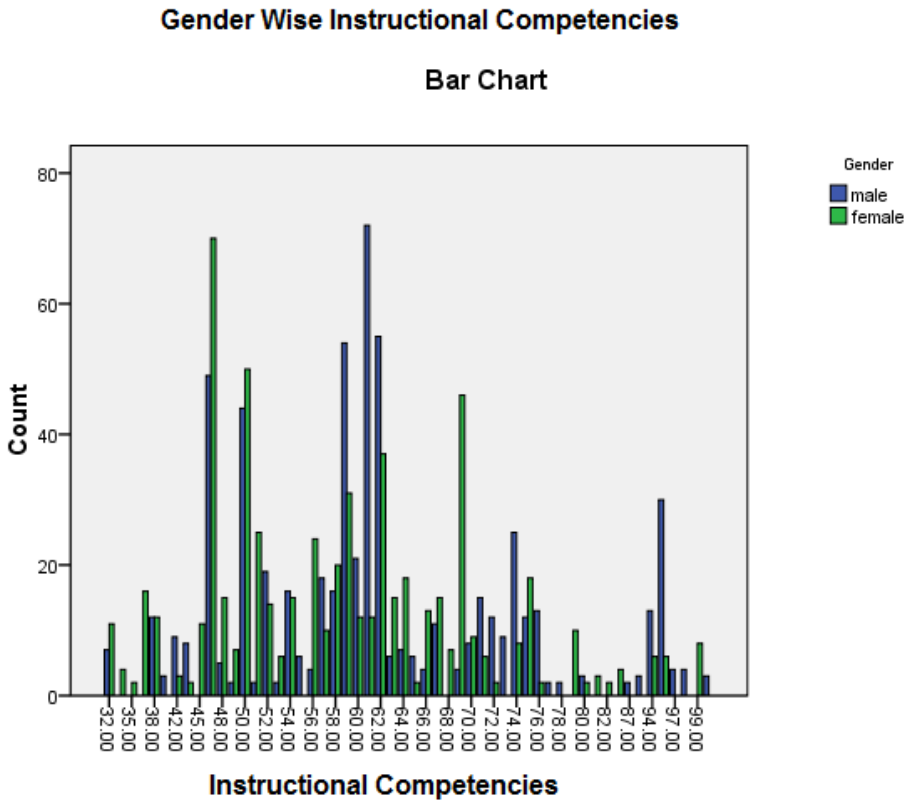


Figure 4. 5 Gender Wise Instructional Competencies

The figure 4.5 shows the gender wise SSTs instructional competence of ICT use in teaching. Chart depicts that male SSTs have better instructional competence than female SSTs in using ICT in teaching.

Objective no.6

To determine **gender differences** in Secondary School Teachers (SST)' **beliefs** about the use of computer Technology in teaching.

Research Hypothesis H_{o6}

There is no significant difference among male and female secondary (SSTs) beliefs about using ICT technology in teaching.

Table 4. 30 Comparison of the beliefs about using ICT in teaching of male and female (SSTs) about ICT use in teaching

Groups	N	Mean	Std	Independent sample t-test α=0.05			
				Df	M.D	T	Sig
Male	635	12.8016	3.33863				
Female	618	13.5322	2.58973	1253	-.73055	-4.316	.000

Table 4.30 shows the comparison of the beliefs about using ICT in teaching of male and female (SSTs). The mean scores of male SSTs (M=12.8016) and female SSTs (M=13.5322) were which indicate that female SSTs have better beliefs in using ICT in teaching than male. However female teachers have more variation (13.5322) in data than femalk2e teachers (12.8016). Further the mean difference between the two groups was (-.73055). Based on the mean difference the significant 2-tailed value (0.000) is less than the significant value (0.05). This shows that there is significant difference among male and female (SSTs) beliefs about using ICT in teaching.

Further the result of t value, the hypothesis "There is no significant difference among male and female secondary school teachers (SSTs) beliefs about using ICT cannot be accepted. So, it was resolved that there is a significant difference among male and female (SSTs) beliefs about using ICT in teaching.

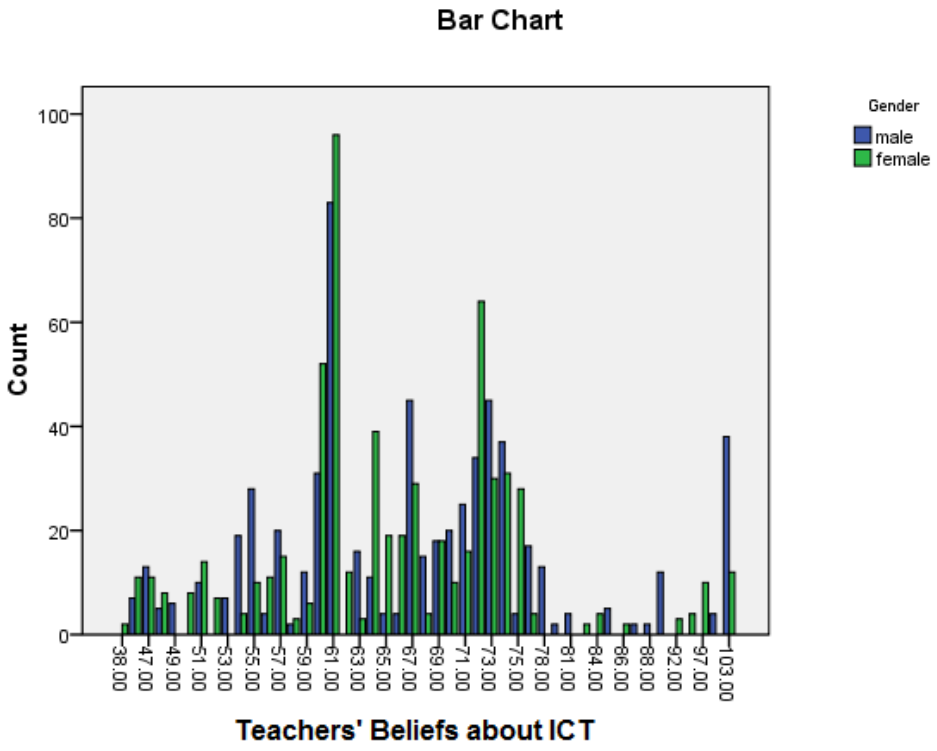


Figure 4. 6 Gender Wise Teachers' Beliefs about ICT

The figure 4.6 indicates the male and female SSTs beliefs about the ICT use in teaching. The female SSTs have better belief of ICT use than male SSTs.

Objective no.7

To explore the status of availability of computer related **facilities** in public and private sector schools.

Research Hypothesis H_{o7}

There is no significant difference in the mean score of the status of availability of computer related facilities in public and private sector secondary schools.

Table 4. 31 Responses of Secondary School Teachers about the availability of computer related facilities in public and private sector secondary schools

Statements	Private Sector Schools			Public Sector Schools		
	Yes %	No %	Mean	Yes %	No %	Mean
Can you use a computer?	76.2	23.8	1.34	66.7	33.3	1.24
Do you have computer at home?	22.6	77.4	1.79	43.0	57.0	1.57
Do you have an internet access at home?	20.5	79.5	1.81	34.2	65.8	1.66
Do you have computer Lab at school?	71.8	28.2	1.28	77.1	22.9	1.23
Do you have an internet access at school?	64.6	35.4	1.36	75.0	25.0	1.27
Do you have Android Mobile Cell?	25.2	74.8	1.77	40.8	59.2	1.64
Do you have Computer Teacher at school?	30.5	69.5	1.70	58.9	41.1	1.41
Do you have UPS System at school?	82.7	17.3	1.19	91.6	8.4	1.10
Do you have Computer Lab Assistant at school?	57.1	42.9	1.45	59.4	40.6	1.42
Cumulative Results			13.69			12.54

Table 4.31 exhibits the availability of ICT for the secondary school teachers. Most of SSTs 76.2% of private while 66.7% of public sector secondary school teachers know how to use the computer. 77.4% of private while 57% of public sector secondary school teachers do not have computer at home. Similarly, 79.5% private sector while

65.85% public sector SSTs have not any access to internet at home. In contrast 71.8% private schools and 77.1% of public sector schools have computer lab at schools. Similarly, 64.6% private SSTs while 78% public SSTs have internet access at schools. A majority 74.8% of the private schools and 59.2% of public sector SSTs have not android mobile phones. Majority 69.5% of private sector schools have no computer teachers at school while 58.9% of public sector schools have the computer teacher however 41.1% of public schools are still deprived from computer teacher. 82.7% of private while 91.6% of public sector schools have the facility of UPS system for backup electricity purposes. For assisting and maintenances purposes57.1% private sector schools and 59.4% of public schools have computer lab assistants at school though majority of 42.9% of private and 40.6% of public schools haven't computer lab assistant at schools. The cumulative mean score (M=13.69) of private sector and (M=12.54) of public sector respectively shows that private sector schools have better availability of computer related facilities than public sector schools. Form the Table it is concluded that majority of the secondary school teachers can use and operate computer, but they do not have personal computers. On the other hand, majority of the SSTs have no internet facility at home but have the facility at school. A huge number of SSTs do not have advanced mobile phones like Android mobiles. For electricity backup and computer lab assistance and maintenance majority of secondary schools have the facility of UPS and computer lab assistants. In nutshell research question No 7: What is the status of availability of computer related facilities in public and private sector secondary schools? Is answered that the secondary school teachers can use and operate computer, but they do not have personal computers. On the other hand, SSTs have no internet facility at home but have the facility at school. In the same way SSTs do not have advanced mobile phones like Android mobiles. For electricity backup and

computer lab assistance and maintenance secondary school teachers have the facility of UPS and computer lab assistants in their school.

Table 4. 32 Alignment of Research Objectives, Hypotheses and Statistical Treatment with Findings of Research

Objectives	*Research Hypotheses*	*Statistical Treatment*	*Findings*
Objectives 1 To Assess secondary school teachers Beliefs about the use of computer technology in teaching.	**R. Question 1** What do secondary school teachers think about the use of computer technology in teaching?	Percentage	78.5% of SSTs believe that use of ICT can support student centered learning. 74% never collaborate projects with other schools. 72% believe that introduction of ICT in schools can change the teaching methods. 31% SSTs intentionally use ICT to improve the communication skills of the students and never used ICT for teaching purposes. (Table 4.4).
Objectives 2 To determine secondary school	**R. Question 2** What are secondary school	Percentage	83.2% SSTs never use ICT for maintaining progress of the students. 78.1% never communicate with their

teachers' instructional competence in using information and communication technology.	teachers' instructional competence in using ICT in teaching?		student's using ICT. 70.6% never organize computers within the class for collaborative activities. 71.3% never use any software for teaching. 71.1% SSTs never use ICT in the classroom for small group activities and individual learning of students.70.9% of the teachers are of the view that there should a policy at national level for introduction of ICT in school. 67.8% SSTs never use educational software related to the subject matter. (Table 4.5).
Objectives 3 To compare secondary school teachers' beliefs about use of ICT in	H_{03} there is no significant difference in the mean score of public and private	t-test	It was found that the mean difference between the public and private SSTs was (-5.29635). The significant 2-tailed value (0.00) is less

teaching in public and private sector schools.	sector secondary school teachers' beliefs regarding the use of computer technology in teaching.		than the significant value (0.05), therefore the H_{03} was rejected. (Table 4.6).
Objectives 4 To compare public and private sector secondary school teachers' instructional competence in using ICT in teaching. According to theoretical framework this objective has further sub-objectives regarding technology	H_{04}(a) Technology literacy approach H_{04}(b), H_{04}(c), H_{04}(d), H_{04}(e), H_{04}(f), H_{04}(g), H_{04}(h) Knowledge deepening approach H_{04}(i), H_{04}(j), H_{04}(k), H_{04}(l),	t-test	It was found that the mean score of private SSTs was (M=55.9004) while public SSTs was (M=65.9075) which indicate that public sectors SSTs have better instructional competence in using ICT in teaching than private sector, therefore, H_{04} was rejected (a), *(*Table 4.7). All the sub- hypotheses were rejected accept H_{04}(j) (Table no 4.16). and the hypotheses H_{04}(l), *have failed to rejected.* (Table 4.18).

literacy approach, knowledge deepening and knowledge creation.	H_{04}(m), H_{04}(n), H_{04}(o) Knowledge creation approach H_{04}(p), H_{04}(q), H_{04}(r), H_{04}(s), H_{04}(t), H_{04}(u), H_{04}(v)		
Objectives 5 To compare gender differences regarding instructional competence in using ICT in teaching.	H_{05} there is no significant difference in the mean score of male and female secondary school teachers' instructional competence in using ICT.	t-test	The mean difference between the two groups was (4.06971). Therefore, the significant 2-tailed value (0.000) is less than the significant value (0.05). So, the hypotheses was rejected. However male teachers have more variation (14.32745) in data than female teachers (13.17433) (Table 4.29).
Objectives 6 To determine gender differences in secondary	H_{06} there is no significant difference in the mean score of	t-test	the mean difference between the two groups was (-.73055). Based on the mean difference the significant 2-

school teacher beliefs about the use of computer technology in teaching.	male and female secondary school teachers' beliefs about using ICT technology in teaching		tailed value (0.000) is less than the significant value (0.05). This shows that there is significant difference among male and female (SSTs) beliefs about using ICT in teaching. Therefore, the hypotheses were rejected (Table 4.30).
Objectives 7 To explore the status of availability of computer related facilities in public and private sectors schools.	H_{07} there is no significant difference in the mean score of the status of availability of computer related facilities in public and private sector secondary schools.	Percentage	82.7% of private while 91.6% of public sector schools have the facility of UPS. 79.5% private sector while 65.85% public sector SSTs have not any access to internet at home.76.2% of private SSTs while 66.7% of public SSTs have some know- how to use the computer. 77.4% of private while 57% of public SSTs do not have computer at home. In contrast 71.8% private schools and 77.1% of public

	schools have computer lab. 64.6% private SSTs while 78% public SSTs have internet access at schools. 74.8% of the private schools and 59.2% of public SSTs have not android mobile phones. 69.5% of private schools have no computer teachers at school the cumulative mean score of private sector and of public sector shows that private sector has better availability of computer related facilities than public sector (Table 4.31).

CHAPTER 5

SUMMARY, FINDINGS, DESCUSSION, CONCLUSIONS, AND RECOMENDATION

After analysis in preceding part of the work, present chapter highlights the results/findings of study associated with teachers' beliefs and instructional competence in using ICT in District Mardan, KPK, Pakistan. The present chapter also demonstrates conclusions based on results. Discussion is also a part of this chapter. Recommendations are also added on the bases of answers and researcher personal annotations. Kept in mind the status of teachers' beliefs and instructional competence at secondary level the researcher gave guideline of TPL for ICT use at secondary level which has been cited at the end of the present chapter. Recommendations were also proposed for forthcoming scholars.

5.1 Summary

The study was directed to discover public and private sectors secondary school teachers' beliefs and instructional competence of in using (ICT). Main points of the study were to assess SSTs beliefs about the use of computer Technology in teaching, to determine SSTs instructional competence in using (ICT), to compare SSTs beliefs about use of ICT in teaching in public and private sector schools, to compare public and private sector Secondary School Teachers' instructional competence in using ICT technology in teaching, to compare gender differences regarding instructional competence in using ICT in teaching, to determine gender differences in (SSTs) beliefs about the use of computer Technology in teaching, to explore the status of availability of computer related facilities in public and private sector schools.

First of all, the researcher described the incidental view of the work, exploration of the problematic task, rational of the study, aims, hypothesis, theoretical framework, conceptual framework, significance of the study, short description of the research methods, population and sample, questionnaire validity and reliability, data collection tool and research ethics etc. The second chapter consist of appraisal of the interrelated works about the concept of teachers' beliefs and instructional competence in using ICT in teaching learning process. UNESCO ICT-CFT frame work and its three approaches were crossed with six educational components such as to understand ICT in education system, to comprehend ICT in curriculum and assessment process, to recognize the related pedagogy in instructions, usage of ICT in school environment through different methods, use of ICT in school organization and administration, to diagnose various means of TPL in education, instructional competence (IC), importance of ICT competence for teachers, teachers technological competence, teachers' beliefs and attitude towards the use of ICT and Researches on teachers' instructional competence using ICT.

Than to analyze the objectives of the study the researcher selected the research methodology, validate the questionnaire from experts of the field of education. Reliability of the questionnaire was found out. The Cronbach's Alpha value of the study was 0.948. For pilot testing 100 SSTs were randomly selected. Then data was analyzed through SPSS.

It was a descriptive study, so a five-point rating scale questionnaire were adapted to measure secondary school teachers' beliefs and instructional competence in public and private sector of District Mardan. The questionnaire was based on three approaches TLA, KDA, KCA which were crossed with six components of education

system and each component has 3 questions regarding Teachers' beliefs and instructional components. There were 63 close ended questions and 2 open ended questions to know the grass root reality but did not receive any response from respondents. So only the close ended questions were analyzed.

Sample of the study were taken 20 % of each stratum of the population from both sectors public/private and male/female SSTs were randomly selected. For respondents' selection in secondary schools proportionate stratified random sampling technique was used. Data was collected through three sources like WhatsApp, email, and post to contact faraway respondents while nearest respondents were visited personally by the researcher. Teachers was motivated and guided by the researcher. In rural areas mostly Urdu version of the questionnaire was distributed for respondent convenience. Finally, data was collected the adapted questionnaire of UNESCO ICT-CFT, (2011). The questionnaire was graded and score for data entry in SSPSS, version 21. Data was entered and started analysis. For measuring the first part of the questionnaire which consist of demographic variables, descriptive statistics were used for analysis. The descriptive statistics consist of mean, frequency, percentage, and standard deviation in present study. For testing of null hypothesis inferential statistics were used. It comprises of mean, percentage, t-test. Findings were testified through SPSS according to aims of research project. The outcomes were confirmed at 0.05 level of significance which is considered as standard value. The findings and results showed that mostly SSTs have a belief that the use of ICT has an encouraging influence on students learning in classroom. SSTs also have the beliefs that the use of ICT can change the teaching methods and school environment. But frequently use ICT facilities for educational purposes. Secondary school teachers are also avoiding ICT tools and gadgets in teaching learning process.it may be due to unavailability of ICT related facilities in

schools or due to absence of instructional competencies among teachers. It was also observed that mostly SSTs do not have personal android phones and internet facility at home as well as at school. It was also concluded that a significant difference exists among public and private sector (SSTs) beliefs concerning the use of ICT in teaching. It was also showed that there is a significant difference among public and private sector secondary school teachers (SSTs) instructional competence in using ICT in teaching. Public sector is comparatively better than in instructional competence and belief of ICT use in teaching. It was determined that there is a significant difference among male and female (SSTs) instructional competence in using Information and communication technology. Male SSTs have better instructional competence than female SSTs. It was resolved that there is a significant difference among male and female (SSTs) beliefs about using ICT in teaching. Public sector SSTs has better beliefs and instructional competence about the use of ICT from private sector SSTs.

5.2 Findings of the research study

There are two types of findings in this study.

1. Findings obtained from descriptive analysis of the study.
2. Findings obtained from inferential analysis of the study.

The above two types of findings were achieved from data collected by the researcher through questionnaire of the study.

Findings Obtained After Descriptive Analysis

a. It was noticed that there were 1253 SSTs selected for the study as a sample. There were 635 were male SSTs and 618 were female SSTs. (Table 4.2). The table also

indicated that 50.6 % were male SSTs and 49.3 % were female SSTs in the selected sample.

b. It was found that there was a total of 1253 SSTs in which 703 SSTs were from private sector and 550 were from public sector. The percentage of private SSTs was 56% and public SSTs were 44% in the selected sample of the study. Data were also distributed on graph (Table 4.3).

c. To assess (SST)' beliefs about the use of computer Technology in teaching

R.Q. What do Secondary School Teachers (SSTs) think regarding the use of computer technology in teaching?

It was found that the highest percentage (78.5%) of respondents believe that use of ICT can support student centered learning. 74% respondents never collaborate projects with other schools. 72% of the respondents believe that introduction of ICT in schools can change the teaching methods of teachers, however, 31% of respondents intentionally use ICT to improve the communication skills of the students and never used ICT for teaching purposes. (Table 4.4).

d. To determine secondary school teachers' instructional competence in using (ICT).

R.Q. To what extent Secondary School Teachers (SSTs) have instructional competence in using ICT in teaching?

It was found that the highest percentage (83.2%) respondents never use ICT for maintaining progress of the students. 78.1% never communicate with their student's using ICT. 70.6% of teachers never organize computers within the class for collaborative activities. 71.3% never use any software for teaching. 71.1% teachers

never use ICT in the schoolroom for small group (micro) activities and individual learning of students. 70.9% of the teachers are of the view that there should a policy at national level for introduction of ICT in school. 67.8% of the respondents never use educational software related to the subject matter. (Table 4.5).

5.2.1 Findings obtained from inferential analysis.

This part includes the findings of t-test.

1. It was found that the mean score of public SSTs were (M=69.9196) and private SSTs was (M= 64.6232) which indicate that public sectors SSTs have better beliefs of ICT use in teaching than private sector SSTs. The mean difference between the two groups was (-5.29635). The mean difference the significant 2-tailed value (0.00) is less than the significant value (0.05) (Table 4.6).

2. It was found that the mean score of private SSTs was (M=55.9004) while public SSTs was (M=65.9075) which indicate that public sectors SSTs have better instructional competence in using ICT in teaching than private sector teachers (Table 4.7).

3. It was found that the mean score of private SSTs was (M=36.0411) while public SSTs was (M=44.2322) which indicate that public sectors SSTs have better instructional competence in using ICT in teaching in the context of technology literacy approach than private sector teachers (Table 4.8).

4. It was found that the mean scores of private sector SSTs (M=7.7918) and public sector SSTs (M=44.2322) were which indicate that public sectors SSTs have better instructional competence in using ICT in teaching in the context of policy awareness about ICT. **(**Table 4.9).

5. The results showed that the mean scores of private sector SSTs (M=5.2635) and public sector SSTs (M=6.9269) were which indicate that public sectors SSTs have better instructional competence in ICT technology in teaching in the in the context of **basic knowledge** about ICT (Table 4.10).

6. The analysis portrayed that the mean scores of private sector SSTs (M=5.7606) and public sector SSTs (M=7.7093) were which indicate that public sectors SSTs have better instructional competence in using ICT in teaching in the context of integration of technology (Table 4.11).

7. It was depicted that the mean scores of private sector SSTs (M=6.4504) and public sector SSTs (M=8.4388) were which indicate that public sectors SSTs have better instructional competence in using ICT technology (ICT) in teaching in the context of integration of technology (Table 4.12).

8. The results showed that the mean scores of private sector SSTs (M=5.6124) and public sector SSTs (M=4.1459) were which indicate that public sectors SSTs have better instructional competence in using ICT in teaching in the context of standard classroom (Table 4.13).

9. The result of the analysis displayed that the mean scores of private sector SSTs (M=6.6289) and public sector SSTs (M=7.6088) were which indicate that public sectors SSTs have better instructional competence in using ICT in teaching in the context of digital literacy (Table 4.14).

10. The results depicted that the mean scores of private sector SSTs (M=34.8895) and public sector SSTs (M=36.9325) were which indicate that public sectors SSTs have

better instructional competence in using ICT technology in teaching in the context of knowledge deepening approach (Table 4.15).

11. The results described that the mean scores of private sector SSTs (M=12.6374) and public sector SSTs (M=12.1024) were which indicate that private sectors SSTs have better instructional competence in using ICT in teaching in the context of policy understanding in ICT than public sector (Table no 4.16).

12. The results displayed that the mean scores of private sector SSTs (M=6.2394) and public sector SSTs (M=6.8373) were which indicate that public sectors SSTs have better instructional competence in using ICT in teaching in the context of knowledge application. However public sector teachers have more variation (2.12198) in data than private sector teachers (1.70878) (Table 4.17).

13. It was depicted that the mean scores of private sector SSTs (M=5.7351) and public sector SSTs (M=5.7560) were which indicate that private and public sectors SSTs have almost equal instructional competence in using ICT in teaching in the context of complex problem solving (Table 4.18).

14. It was displayed that the mean scores of private sector SSTs (M=2.9037) and public sector SSTs (M=3.2967) were which indicate that public sectors SSTs have better instructional competence in using ICT in teaching in the context of complex tools in ICT. However public sector teachers have more variation (1.67657) in data than private sector teachers (1.51093) (Table 4.19).

15. It was described that the mean scores of private sector SSTs (M=3.6204) and public sector SSTs (M=4.1250) were which indicate that public sectors SSTs have better instructional competence in using ICT in teaching in the context of collaborative groups (Table 4.20).

16. The results of the analysis showed that the mean scores of private sector SSTs (M=3.7535) and public sector SSTs (M=4.7660) were which indicate that public sectors SSTs have better instructional competence in using ICT technology in teaching in the context of managing and guiding in ICT (Table 4.21).

17. The analysis described that the mean scores of private sector SSTs (M=55.1679) and public sector SSTs (M=60.8250) were which indicate that public sectors SSTs have better instructional competence in using ICT in teaching regarding knowledge creation approach (Table 4.22).

18. The analysis showed that the mean scores of private sector SSTs (M=11.8045) and public sector SSTs (M=12.0640) were which indicate that public sectors SSTs have better instructional competence in using ICT in teaching in the context of policy innovation. However public sector teachers have more variation (3.68860) in data than private sector teachers (3.26143) (Table 4.23).

19. The outcomes of the study discovered that the mean scores of private sector SSTs (M=7.8909) and public sector SSTs (M=9.9360) were which indicate that public sectors SSTs have better instructional competence in using ICT technology in teaching in the context of knowledge society skills. However public sector teachers have more variation (3.39758) in data than private sector teachers (3.39758) (Table 4.24).

20. The data results showed that the mean scores of private sector SSTs (M=8.0949) and public sector SSTs (M=8.1225) were which indicate that public sectors SSTs have little better instructional competence in using ICT technology in teaching in the context of self-management. However private sector teachers have little more variation (2.17355) in data than public sector teachers (2.01950) (Table 4.25).

21. The results of the data analysis portrayed that the mean scores of private sector SSTs (M=5.8819) and public sector SSTs (M=7.6998) were which indicate that public sectors SSTs have better instructional competence in using ICT in teaching in the context the use of pervasive tools of ICT. However private sector teachers have little more variation (2.88458) in data than public sector teachers (2.57295) **(Table 26).**

22. The mean scores of private sector SSTs (M=5.4037) and public sector SSTs (M=6.6399) were which indicate that public sectors SSTs have better instructional competence in using ICT technology in teaching in the context of learning organization. However public sector teachers have little more variation (3.34359) in data than private sector teachers (3.11465) (Table 4.27).

23. The mean scores of private sector SSTs (M=16.0809) and public sector SSTs (M=16.3400) were which indicate that public sectors SSTs have little better instructional competence in using ICT technology in teaching in the context of teacher as model learner (Table 4.28).

24. The results of the analysis revealed that the mean scores of male SSTs (M=62.2186) and female SSTs (M=58.1489) were which indicate that male SSTs have better instructional competence in using ICT technology in teaching than female. However male teachers have more variation (14.32745) in data than female teachers (13.17433) (Table 4.29).

25. The data results showed that the mean scores of male SSTs (M=12.8016) and female SSTs (M=13.5322) were which indicate that female SSTs have better beliefs in using ICT in teaching than male (Table 4.30).

26. It was depicted from data analysis that 82.7% of private while 91.6% of public sector schools have the facility of UPS system for backup electricity purposes. 79.5%

private sector while 65.85% public sector SSTs have not any access to internet at home.76.2% of private SSTs while 66.7% of public sector secondary school teachers know how to use the computer. 77.4% of private while 57% of public sector secondary school teachers do not have computers at home. In contrast 71.8% of private schools and 77.1% of public sector schools have computer lab at schools. Similarly, 64.6% private SSTs while 78% public SSTs have internet access at schools. 74.8% of the private schools and 59.2% of public sector SSTs don't have android mobile phones. 69.5% of private sector schools have no computer teachers at school the cumulative mean score (M=13.69) of private sector and (M=12.54) of public sector respectively shows that private sector schools have better availability of computer related facilities than public sector schools (Table 4.31).

5.3 Discussion of the Study

I belong to the rural areas of district Mardan KPK, Pakistan. Professionally, I am a secondary school teacher in tehsil Katlang, district Mardan. The provincial Government of KPK has developed computer laboratories in secondary schools for facilitation of students and teachers regarding integration in teaching learning process. Being a practitioner in the same field it was observed that generally, secondary school teachers did not utilize those labs for teaching. To find out the reason of this problem I planned this study. The main variables of the study were SSTs' beliefs and instructional competence about the use of ICT in teaching. The study was descriptive in nature in which survey design was used. The UNESCO ICT-CFT based questionnaire (attached as appendices) was adapted for data collection.

To see the general scenario of the SSTs beliefs of ICT use was checked. Weather the SSTs think about the ICT use in teaching or not. The findings of the existing study

are dependable with the study of Almarri et al, (2019), Kihoza et al, (2016), Khan et al, (2012), Ghavifekr & Rosdy, (2015), Scherer et al, (2015) and (Schwartz, 2018; Wang, 2019). Munir & khan, (2015). Teachers' belief and ICT integration in teaching learning process are directly proportional to each other. Because if SSTs have no idea about something like internet, smart phone, websites, and ICT related devices, how they can use it.

Secondly, secondary school teachers' instructional competence of ICT use in instruction was checked. Weather the SSTs have some instructional competence to use ICT in teaching learning process. The findings of the present study are reliable with the study of Tucker & Stronge, (2017), (Archer et al, 2014; Chauhan, 2017), (Jamieson-Procter et al, 2013), Ghavifekr & Wan Athirah, (2015), Panigrahi, (2016), Munir & khan, (2015), Scherer et al, 2018), Alshammari et al, 2016) and Arafah & Johari, (2015). Abegail & Gonzales, (2018). Teachers are role models for their students so teacher should have competence in transferring their knowledge skills and abilities. But in current study SSTs are showing low competence in ICT integration in teaching learning process. It may be due to the unavailability of ICT related facilities in schools as well as at home. Or due to poor Continuous professional development (CPD) during service. Selection criteria of teachers is also a factor of low competency in ICT integration. Qualification of teachers is also a factor.

Thirdly, the SSTs beliefs were compared in public and private sector. The results of the present study are constant with the study of Karapakkam & et. al, (2018), Scherer & et, al. (2017), Lavigne, (2014), Pall & Batra, (2016) and Ozdamli, (2017). In current study the public sector SSTs have better belief about ICT use in teaching. It may be due to their adaptation of teaching as a profession as the public sector teachers

have been selected under pre-defined criteria. That is why they considered the importance of ICT use in present technological world.

Fourth, SSTs instructional competence of ICT use were compared in public and private sector. The findings of the existing study are reliable with the study of Arafah & Johari, (2015), Munir & khan, (2015), Ziphorah, (2013) and Khan & et al, (2012). Public sector SSTs are showing better instructional competencies in ICT integration. It may due their special selection/ pre-defined criteria for recruitment of specific posts in the education department. Or maybe due to their proper pre and in service training.

To reach the ground realities of SSTs instructional competence of ICT use in public and private sector the competence was checked in different context (Technology literacy approach, Knowledge deepening approach and knowledge creation approach) of UNESCO ICT-CFT based questionnaire. The findings of the first context technology literacy approach are constant with the study of Liu & Phelps, (2019), (ASTD, 2013), Gulbahar & Kalelioglu, (2015), kca. Vangrieken et al, (2017), Karuppiah et al, (2019) and Ala-Mutka, (2011). (Bhukuvhani et al, 2011), Mahdum et al, (2019), Butler et al, (2018), Almakani & Williams, (2012), Scherer et al, (2015) Richmond et al, (2020), Schwartz, (2018) &Wang, (2019), Nair, (2017) & Avdeevaa & et. al, (2016). The public sector SSTs instructional competence are better in the context of technology literacy approach. It may be due to their pre-defined selection criteria, Induction program for in-service teachers, continuous professional development (CPD) and high qualification. For ICT integration and teacher professional learning (TPL) in KPK the regional institute of teacher education (RITE), Mardan and provincial institute of teacher education Peshawar (PITE), Peshawar is playing vital role. It may be due to present

technological environment and curriculum change, instructional competence, and experience.

The finding of the second approach (knowledge deepening approach) is dependable with the study of Marcial & Rama, (2015), Aslan & Zhu, (2016), Arnseth & Hatlevik, (2012), Kampschulte & Eilert, (2016), Kreijns et al, (2013), Somekh, (2013) and Liu & Phelps, (2019), Munir & khan, (2015), Almakani & Williams, (2012), Scherer et al, (2015), Lai, (2018), Ghavifekr & Wan Athirah, (2015), Patahuddin & et. al. (2016) and Scherer et al, (2018). It may be due to the instructional competence of public sector SSTs, teacher professional learning and continuous professional development, training, high qualification of SSTs and pre-defined selection procedure of government and experience of teachers. Because knowledge application is impossible without ICT competency in the relevant field. Because professional learning networks (PLNs) like face book, Skype, What Sapp, E-mail, Twitter, IMO, viber and messenger play key role for communication in groups for learning purpose. The findings of sub part of knowledge deepening approach regarding SSTs instructional competence in using ICT in teaching in the context of policy understanding of ICT is constant with the study of Philomina & Amutha, (2016), Jhonston, (2015), Gil-Garcia et. al, (2018) and Longo & et. al, 2015). Private sector SSTs show better results in the context of policy understanding in ICT. It may be due to the adaptation of new trends and ways of teaching. Public sector SSTs are traditional teachers in this case.

The findings of the third approach (knowledge creation approach) of the study state similarity with the study of Jamieson-Procter et al, (2013), Patahuddin & et. al. (2016), Debbagh & Jones, (2018) and Mohebi & Helder, (2019), (Karuppiah et al, 2019), Philomina & Amutha, (2016). It may be due to the new education policy,

training, TPL and continuous professional development (CPD) that enabled the teachers to create their teaching method more interesting. Or may be due to the instructional competence of SSTs through in-service and preservice training that needed to be search information, managing and maintaining that information for students, process and to communicate with students and teachers in the professional learning network such as Skype, WhatsApp, E-mail, Twitter, IMO, viber and messenger for bringing fruitful results. Or may be due to the changing demands of the 21st century that unwanted changes have taken place in our attitude and actions like unwillingly we keep in touch with mobile phone and internet use for different purposes. Or may be due to training of SSTs that enable to use ICT in teaching for instance abstract concepts can easily be understand by images, pictures, different sounds, animation through cartoons and simulation.

The findings of gender differences regarding competence of ICT use in the study is not constant with the study of Adil & et al, (2013), Papadakis, (2018). It may be due to their context. Furthermore, the study is consistent with the study of Mehmood & Bokhari, (2012). It may be due to the reason that male teachers are more confident in ICT use in teaching or may be due the exposure of male in our society that create differences or due to availability of ICT facility in public boys' secondary schools in respective district that maintain difference in gender. Or may be due to principal support in the male secondary schools of the district Mardan.

The findings regarding gender differences in beliefs of ICT use in the study is dependable with the study of Alazam & et al, (2012). The female SSTs have better belief about ICT use in teaching. It may be due to the use of several applications used by the female SSTs for their daily use such as WhatsApp, adds regarding dressing,

makeup, and other appliances. The female SSTs are good in belief of ICT use comparatively but poor in instructional competence of ICT use in teaching.

The findings to explore the status of availability of computer related facilities in public and private sector secondary schools. The current study is consistent with the study of Gopang, (2016), Munir & khan, (2015). Mostly SSTs of private sector can use and operate computers, but they do not have computers. SSTs of public sector do not have advanced cell phones like Android mobiles. It may be due to the low financial status of SSTs in the respective district.

5.4 Conclusion of the Study

The main purpose of the study was to examine the SSTs beliefs and instructional competence in using ICT in teaching. In case of SSTs beliefs regarding ICT use in instruction it was concluded that secondary school teachers believed that ICT was supportive in student-centered learning, improving the communicative skills of the students and it could change teaching methods of the teachers. However, respondents were never involved in collaborative projects with other schools, and they never used ICT for teaching. It may be due to the reason that they have no facility to project work with other schools or due to lack of competence or maybe due to time deficiency at school.

The second main variable of the study was SSTs instructional competence of ICT use in instruction it was concluded that the respondents had the lowest competencies in using ICT in teaching and software related to subject matter that they are teaching. Furthermore they do not use computers for record keeping of students and communicating with students, evaluating students' achievement, designing lesson plans, maintaining students' record, computer lab for teaching purpose, individual

learning of students in classroom, small groups of students, online materials to support students, problem solving skill of the students, online activities that engage students, to help the students in creating ICT based activities, online learning environment for the support of their students, online collaboration with other schools. It may be due to the low instructional competence of ICT usage or may be due to their interest or lack of continuous professional development (CPD).

In the case of comparison of public and private sector SSTs beliefs regarding ICT use in instruction it was concluded that the public sector SSTs were better in beliefs of ICT use in teaching than private sector SSTs. The reason may be that the public sector SSTs have been through a real challenge of being recruited and they observed that we need a collection of information, assistance, and capabilities for being recruited. So, they have stronger beliefs than private SSTs about ICT use in teaching.

In the case of comparison of public and private sector SSTs instructional competence in using ICT in teaching. The public sector SSTs were observed improved than the private SSTs. It may be due to the motive that the public sector SSTs select according to the pre-defined criteria of the department. And on the other hand, the private sector SSTs do not follow any rules regulation for recruiting the teachers. The private school owners do not fulfill the department policy of recruiting teachers. They recruit teachers which are their relatives or teachers that demand very little payment.

To reach the ground realities, the competence of public and private sector SSTs was compared and checked through the three approaches of the UNESCO ICT-CFT, (2011) framework. It was concluded that the public sector SSTs were better in instructional competence of ICT use in instruction than the private SSTs in the context of technology literacy approach, knowledge deepening approach and knowledge

creation approach. The reason maybe the public SSTs are being recruited through proper channel, so they have well in the context of technology literacy approach, knowledge deepening approach and knowledge creation approach. Or maybe the reason that public sector SSTs are getting induction training after their selection for teaching in different categories of education system. This duration of their training is considered as the probation period. After passing the training examination they have been given the training certificate of the specific category. in this case the RITE Mardan and PITE Peshawar are playing pivotal role in KPK. Or it may be due to the new education policy, training, TPL and continuous professional development (CPD) that enabled the teachers to create their teaching method more interesting.

The gender differences of SSTs instructional competence in using Information and communication technology in teaching showed that the male SSTs are comparatively better than female SSTs in instructional competence of ICT use in instruction. The reason may be due the access of male SSTs towards ICT tools or maybe due to time availability as female did not find more time to use ICT. Or maybe male SSTs are more confident than female SSTs. Or maybe due to the administrative support in male secondary schools in the respective district.

The gender differences male and female (SSTs) beliefs about the use of ICT in teaching depicted that the female SSTs have better belief about ICT use in teaching. It may be due to the use of mobile apps regarding clothes designing, make-up and other appliance for daily use. The female SSTs are good in belief of ICT use but comparatively poor in instructional competence of ICT use in teaching.

It was concluded that most secondary school teachers can use and operate computers, but they do not have personal computers. On the other hand, most of the SSTs have

internet facilities at school. Many SSTs do not have advanced mobile phones like Android mobiles. For electricity backup and computer lab assistance and maintenance many secondary schools have the facility of UPS and computer lab assistants. It may be due to the low financial status of SSTs in the respective district.

5.5 Recommendations of the Study

a. The education department may provide awareness about the importance of ICT in education through departmental seminars, meetings, and group discussions. In addition, some incentive can be provided to teachers on developing ICT competence.

b. The secondary education department may involve the SSTs of different schools at local cluster training centers regarding how to develop the teaching methods in their schools through sharing of practices in facilitating students using ICT tools in instruction during teaching.

c. As the results of the present study detected that secondary school teachers have lack of instructional competence in using (ICT), therefore, it is recommended that the Education Department may provide in-service training regarding integrating ICT in teaching which may include hands on practice of on-line activities that kept engage the students and application of ICT technologies as well as maintaining students' record, designing lesson plan and communication with students through the use of ICT tools such as WhatsApp, google classroom, Email, IMO, Skype, and Zoom. The concerned department may provide educational application software, for example Encarta encyclopedia, Dictionary.com and educational websites like sabak.pk etc. to their SSTs or

head of the school. Furthermore, this software needed no internet connection. It makes easy the teaching learning process for teachers in the specific area.

d. The Secondary Education department may instruct private school owners/ organizations regarding promoting the use of ICT in teaching at their respective schools.

e. The concerned authority may provide training facility of ICT use in teaching for SSTs in private sector that help in practice of on-line activities that keep engage the students and application of ICT technologies in classroom as well as maintaining students' record, designing lesson plan and communication with students using ICT tools like, WhatsApp, Email, IMO, Skype and Zoom.

f. The secondary education department may provide the facility of ICT training in the specific area and sector of policy awareness about ICT, basic knowledge of curriculum and assessment, integration of technology in classroom and administration as well as teacher professional learning. Monitoring and incentives may produce encouraging results.

g. The authority may provide training of ICT use during lecture demonstration and to evaluate students' achievement such as test records, examination records, participation in games, debates, painting competition, writing skill competition and Qirrat competition etc. For the application of ICT in classroom educational software and its training may be provided to SSTs. The teacher education curriculum may be emphasized for incorporation of ICT integrating teaching approaches in teacher training during practice. The education department may arrange specific ICT based training sessions frequently for teachers to groom their ICT integrated instructional competence like lesson plan by integrating

technology and other uses of ICT in teaching. Through continuous professional development (CPD) sharing of experiences about ICT use with other SSTs may help in the incorporation of technology in teaching process. The private sector education authority may train the SSTs regarding usage of software of different subjects, making and usage of email address and maintaining students' record. The public sector authority may conduct seminars and meetings of motivational speakers for awareness of the importance of ICT use in teaching, individual learning, and small group activities. Special incentives for attending meetings and seminars may bring fruitful results.

h. The education department may conduct on-line courses or continuous teacher professional learning (TPL) programs to enhance SSTs competence in their subject area which directly impact students' performance at specific level.

i. The secondary education department may instruct the private school owners to provide the facility of ICT training in the specific area and sector of policy understanding, knowledge application, relate the pedagogy to complex problem-solving methods, integrate in teaching the complex tools of ICT, provide facilitation of collaborative group environment and teacher professional learning with managing and guidance. The teacher education curriculum can be redesigned by incorporating ICT integrating teaching approaches.

j. As the finding showed that public sector SSTs have comparatively better instructional competence in using ICT in teaching regarding knowledge creation approach. The secondary education department of public sector may conduct training of self-management in pedagogy with private schools to design online activities for students to enhanced problem solving skills, creativity and

learning using ICT in teaching. The public secondary education department may instruct the private school owners to provide the facility of ICT training in the specific area and sector of policy innovation, knowledge society skills, self-management, and use of pervasive technology in teaching, learning organization and teacher as a model learner.

k. As majority of the secondary school teachers do not have computers at home. Therefore, the government official may provide iPad or laptop to teachers for teaching purpose.

l. As the mean scores of male SSTs and female SSTs indicated that male SSTs have comparatively better instructional competence in using information and communication technology in teaching than female SSTs. So, the secondary education department may arrange special separate training for female SSTs regarding using of ICT in teaching. In- service training program can be arranged regarding sharing of information and collaboration with ICT expert outside school. In addition, some incentives may provide recognition in the shape of appreciation certificates, shields etc for encouraging results in this regard.

5.6 Recommendations for Future

Another study may be conducted in which the interview technique can be used from the respondents of public and private secondary school teachers (SSTs) to check the SSTs beliefs regarding the usage of ICT in teaching.

Qualitative study may be plan in future for the analysis of the open-ended questions of the questionnaire, which was not responded by SSTs in the said study.

Same study can be replicated through observational technique to check the instructional competence of the SSTs in integrating technology in teaching during class in the respective district.

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APPENDICES

Appendix - A

Questionnaire for Secondary School Teachers' (SST)

Dear respondent! I am a PhD level research scholar in education discipline at NUML. I need your cooperation in filling this Questionnaire. The information will be kept confidential and be used for re-search purposes only.

In Order to evaluate Secondary school teachers' beliefs and instructional competence in using information and communication technology (ICT) in District Mardan. Your views are needed on this questionnaire. I will be thankful to you.

Note: (In present study ICT resources include computer lab facility, presence of computers, access to internet, mobile phone, computer teacher, uninterrupted power supply (UPS) and Computer Lab Assistant etc.)

PhD Scholar

Demographic variable: Please Tick (√) in a relevant box.

Gender:	Male	Female			
School Status:	Public	Private			
Age:	> 25	25 - 30	30 - 35	35 - 40	< 40
Job Experience (Years):	> 5	5 - 10	10 - 15	15 - 20	< 20
Subject matter:	English	Urdu	Maths	Islamic Std	G. Science
	Pak. Std	Physics	Botany	Chemistry	
Qualification:	Graduate	Master	M.Phil	Ph.D	Other
Area Status:	Rural	Urban			

Please, read each statement carefully and mark the points you agree on the given scale with (√).

Sr. #	Statement					
Indicate the extent to which you integrate technology.		Never	Rarely	Frequently	I have no idea	Always
TLAPA2	Students' use of ICTs can support student-centered learning.					
TLAPA3	ICTs has limited capacity to provide benefits in the classroom.					

Indicate the extent to which you integrate technology.		Never	Rarely	Frequently	I have no idea	Always
TLACA1	Do you use ICT during teaching of your subject?					
TLACA2	Do you use educational software related to your subject matter?					
TLACA3	Do you use ICT applications to evaluate student achievement?					
TLAP1	Do you use ICT resources in your Teaching?					
TLAP2	Do you share your experience of ICT use with other teachers?					
TLAP3	Do you design lesson plan by incorporating ICT?					
TLAICT1	Do you use any software for teaching?					
TLAICT2	Do you use an email address?					
TLAICT3	Do you use a computer to maintain record of students?					
TLAOA1	Do you use of a computer lab for teaching purposes?					
TLAOA2	Do you use ICT in the classroom for individual learning of students?					
TLAOA3	Do you use ICT in the classroom for small group activities?					
TLATPL1	Do you use ICT to enhance your students' performances?					
TLATPL2	Do you use ICT to learn about your subject matter?					
TLATP3	Do you teach some courses online?					

KDAPU1	Do you think that ICTs could change the school environment?					
KDAPU2	Do you think that for introduction of ICT in school there should be a policy at national level?					
KDAPU3	Do you think that introduction of any policy for ICT in school can change teaching practice in classroom?					
KDACA1	Do you use ICT in teaching to make students to understand real world problems?					
KDACA2	Do you use innovative ways of assessment using ICT?					
Indicate the extent to which you integrate technology.		Never	Rarely	Frequently	I have no idea	Always
KDACA3	Do you help your students in how to apply learnt knowledge?					
KDAP1	Do you use project- based learning in classroom?					
KDAP2	Do you deal with real world problems in project based learning?					
KDAP3	Do you design online materials for supporting your students?					
KDAOA1	Do you organize computers within the classroom to support collaborative activities?					
KDAOA2	Do you create learning environment through project based activities?					
KDATPL1	Do you share ICT recourse with your colleagues?					
KDATPL2	Do you collaborate with ICT experts outside school?					
KCAPI1	Would you like to contribute to suggest ICT policy in the school?					
KCAPI2	Would you like to contribute to the discussion of policy for introducing ICTs in the school?					
KCAPI3	Dou you think this introduction of ICT policy can change your teaching methods?					
KCACA1	Do you intentionally use ICTs to improve students' communication skill?					

KCA CA2	Do you intentionally use ICTs to help students to share knowledge?					
KCA CA3	Do you help students acquire problem solving skills using ICT?					
KCA P1	Do you design on-line activities that engage students in problem-solving?					
KCA P2	Do you help students in creating ICT based creativity?					
KCA P3	Can ICT be used for educating students?					
KCA ICT1	Do you used on-line learning environment to support your students learning?					
KCA ICT2	Do you use media to support students learning?					
KCA ICT3	Can we developed online collaboration with others schools?					
KCA OA1	Do you organize the classroom as a learning community?					
KCA OA2	Do you collaborative projects with other schools?					
KCA OA3	Do you use the web to collaborate with your colleagues?					
KCA TPL 1	Do you play a key role in introducing ICTs in your school?					
KCA TPL 2	Do your colleague consult with you to introduce ICTs in their own teaching?					
Indicate the extent to which you integrate technology.		Never	Rarely	Frequentl y	I have no idea	Always
KCA TPL 3	Do you participate in educating teachers during in service training?					
TLA PA1	The policy for introducing ICT in your school prevail at:	National Level	Regio nal level	School level	I don't Know	Other (Specify It)
KD AIC T1	Do you use ICT to communicate with your students?	Whats App	E-mail	Skype	IMO	Others (Please Specify)
KD AIC T2	Do you maintain progress of your students using ICT tools?					
KD AO A3	Do you organize the classrooms to support groups working with different tools?					
KD AIC T3	Do you use open educational resources?	Educati onal week	Middl eweb-	Elsevier library	Others (Please Specify)	None

			smart brief			
KD ATP L3	Do you use open educational recourses for professional learning?					
1	Can you use a computer?	Yes	No			
2	Do you have computer at home?	Yes	No			
3	Do you have an internet access at home?	Yes	No			
4	Do you have computer Lab at school?	Yes	No			
5	Do you have an internet access at school?	Yes	No			
6	Do you have Android Mobile Cell?	Yes	No			
7	Do you have Computer Teacher at school?	Yes	No			
8	Do you have UPS System at school?	Yes	No			
9	Do you have Computer Lab Assistant at school?	Yes	No			

Open ended questions:

1. Identify any problem that you are facing with reference to computer related facility at school level?

_____

_____

2. How could you improve your competency regarding ICT? Any suggestion regarding computer training?

_____

_____

Questionnaire for Secondary School Teachers' (SST)

Dear respondent! I am a PhD level research scholar in education discipline at NUML. I need your cooperation in filling this Questionnaire. The information will be kept confidential and be used for re-search purposes only.

In Order to evaluate Secondary school teachers beliefs and instructional competence in using information and communication technology (ICT) in District Mardan. Your views are needed on this questionnaire. I will be thankful to you.

Note: (In present study ICT resources include computer lab facility, presence of computers, access to internet, mobile phone, computer teacher, uninterrupted power supply (UPS) and Computer Lab Assistant etc.)

PhD Scholar

Demographic variable: Please Tick (√) in a relevant box.

Gender:	Male	Female				
School Status:	Public	Private				
Age:	> 25	25 - 30	30 - 35	35 - 40	< 40	
Job Experience (Years):	> 5	5 - 10	10 - 15	15 - 20	< 20	
Subject matter:	English	Urdu	Maths	Islamic Std	G. Science	
	Pak. Std	Physics	Botany,	Chemistry		
Qualification**:**	Graduate	Master	M.Phil	Ph.D	Other	
Area Status:	Rural	Urban				

Please, read each statement carefully and mark the points you agree on the given scale with (√).

Sr. #	Statement					
TLAPA	**Technology Literacy Approach: Understanding ICT in Education. Policy Awareness (PA)**					
Indicate the extent to which you integrate technology.		Never	Rarely	Frequently	I have no idea	Always
TLAPA2	Students' use of ICTs can support student-centered learning.					
TLAPA3	ICTs has limited capacity to provide benefits in the classroom.					
TLACA	**Curriculum and Assessment: Basic Knowledge (CA)**					
Indicate the extent to which you integrate technology.		Never	Rarely	Frequently	I have no idea	Always
TLACA1	Do you use ICT during teaching of your subject?					
TLACA2	Do you use educational software related to your subject matter?					
TLACA3	Do you use ICT applications to evaluate student achievement?					
TLAP	**Pedagogy: Integrate Technology (P)**					
TLAP1	Do you use ICT resources in your Teaching?					
TLAP2	Do you share your experience of ICT use with other teachers?					
TLAP3	Do you design lesson plan by incorporating ICT?					
TLAICT	**ICT: Basic Tools**					

TL AI CT 1	Do you use any software for teaching?					
TL AI CT 2	Do you use an email address?					
TL AI CT 3	Do you use a computer to maintain record of students?					
TL AO A	**Organization and Administration: Standard Classrooms (OA)**					
TL AO A1	Do you use of a computer lab for teaching purposes?					
TL AO A2	Do you use ICT in the classroom for individual learning of students?					
TL AO A3	Do you use ICT in the classroom for small group activities?					
TL AT PL	**Teacher Professional Learning: Digital literacy (TPL)**					
TL AT PL 1	Do you use ICT to enhance your students' performances?					
TL AT PL 2	Do you use ICT to learn about your subject matter?					
TL AT P3	Do you teach some courses online?					
KD AP U	**Knowledge Deepening Approach: Policy Understanding (KDA)**					
KD AP U1	Do you think that ICTs could change the school environment?					
KD AP U2	Do you think that for introduction of ICT in school there should be a policy it national level?					

KD AP U3	Do you think that introduction of any policy for ICT in school can change teaching practice in classroom?					
KD AC A	**Curriculum and Assessment: Knowledge Application (CA)**					
KD AC A1	Do you use ICT in teaching to make students to understand real world problems?					
Indicate the extent to which you integrate technology.		Never	Rare ly	Freque ntly	I have no idea	Alwa ys
KD AC A2	Do you use innovative ways of assessment using ICT?					
KD AC A3	Do you help your students in how to apply learnt knowledge?					
KD AP	**Pedagogy: Complex Problem Solving (CPS)**					
KD AP 1	Do you use project- based learning in classroom?					
KD AP 2	Do you deal with real world problems in project based learning?					
KD AP 3	Do you design online materials for supporting your students?					
KD AI CT	**ICT: complex tool (ICT)**					
KD AO A	**Organization and administration: Collaborative groups (OA)**					
KD AO A1	Do you organize computers within the classroom to support collaborative activities?					
KD AO A2	Do you create learning environment through project based activities?					
KD AT PL	**Teacher professional learning: Manage and guide (TPL)**					
KD AT	Do you share ICT recourse with your colleagues?					

PL 1						
KD AT PL 2	Do you collaborate with ICT experts outside school?					
KC AP I	**Knowledge creation (KCA) Understanding ICT in education: Policy innovation (PI)**					
KC AP I1	Would you like to contribute to suggest ICT policy in the school?					
KC AP I2	Would you like to contribute to the discussion of policy for introducing ICTs in the school?					
KC AP I3	Dou you think this introduction of ICT policy can change your teaching methods?					
KC AC A	**Curriculum and assessment: Knowledge society skills (CA)**					
KC AC A1	Do you intentionally use ICTs to improve students' communication skill?					
KC AC A2	Do you intentionally use ICTs to help students to share knowledge?					
KC AC A3	Do you help students acquire problem solving skills using ICT?					
KC AP	**Pedagogy: Self-management (P)**					
KC AP 1	Do you design on-line activities that engage students in problem-solving?					
KC AP 2	Do you help students in creating ICT based creativity?					
KC AP 3	Can ICT be used for educating students?					
KC AI CT	**ICT: Pervasive technology**					

Indicate the extent to which you integrate technology.		Never	Rarely	Frequently	I have no idea	Always
KCAICT1	Do you used on-line learning environment to support your students learning?					
KCAICT2	Do you use media to support your students learning?					
KCAICT3	Can we developed online collaboration with others schools?					
KCAOA	**Organization and administration: Learning organization (OA)**					
KCAOA1	Do you organize the classroom as a learning community?					
KCAOA2	Do you collaborative projects with other schools?					
KCAOA3	Do you use the web to collaborate with your colleagues?					
KCATPL	**Teacher professional learning: Teacher as a model learner (TPL)**					
KCATPL1	Do you play a key role in introducing ICTs in your school?					
KCATPL2	Do your colleague consult with you to introduce ICTs in their own teaching?					
KCATPL3	Do you participate in educating teachers during in service training?					
TLAPA1	The policy for introducing ICT in your school prevail at:	National Level	Regional level	School level	I don't Know	Other (Specify It)
KDAI	Do you use ICT to communicate with your students?	Whats App	E-mail	Skype	IMO	Others

CT 1						(Please Specify)
KD AI CT 2	Do you maintain progress of your students using ICT tools?					
KD AO A3	Do you organize the classrooms to support groups working with different tools?					
KD AI CT 3	Do you use open educational resources?	Educational week	Middleweb-smart brief	Elsevier library	Others (Please Specify)	None
KD AT PL 3	Do you use open educational recourses for professional learning?					
1.	Can you use a computer?	Yes	No			
2.	Do you have computer at home?	Yes	No			
3.	Do you have an internet access at home?	Yes	No			
4.	Do you have computer Lab at school?	Yes	No			
5.	Do you have an internet access at school?	Yes	No			
6.	Do you have Android Mobile Cell?	Yes	No			
7.	Do you have Computer Teacher at school?	Yes	No			
8.	Do you have UPS System at school?	Yes	No			
9.	Do you have Computer Lab Assistant at school?	Yes	No			

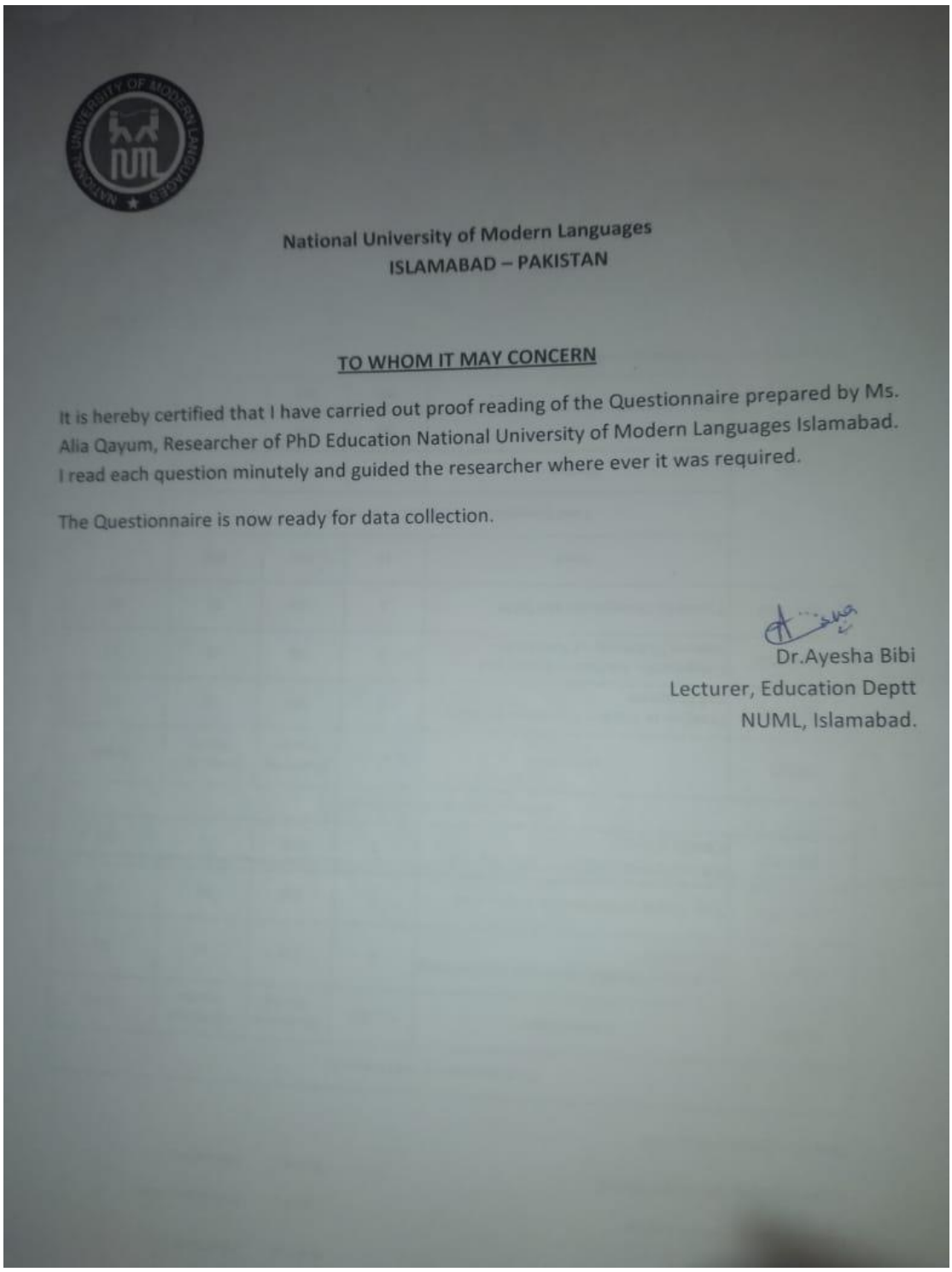
Open ended questions:

1. Identify any problem that you are facing with reference to computer related facility at school level?

2. How could you improve your competency regarding ICT? Any suggestion regarding computer training?

_____

Appendix -



National University of Modern Languages
ISLAMABAD – PAKISTAN

TO WHOM IT MAY CONCERN

It is hereby certified that I have carried out proof reading of the Questionnaire prepared by Ms. Alia Qayum, Researcher of PhD Education National University of Modern Languages Islamabad. I read each question minutely and guided the researcher where ever it was required.

The Questionnaire is now ready for data collection.

Dr.Ayesha Bibi
Lecturer, Education Deptt
NUML, Islamabad.

NATIONAL UNIVERSITY OF MODERN LANGUAGES
FACULTY OF SOCIAL SCIENCES
DEPARTMENT OF EDUCATION

ML.1-4/2017/Edu

Dated: 07-11-2017

To: **Alia Qayyum,**
653-PHD/EDU/F16

Subject: **APPROVAL OF PHD THESIS TOPIC AND SUPERVISOR**

1. Reference Academic Branch's Notification No. ML.6-2/17-Syl/Acad dated 31-Oct-2017, the Faculty Board of Studies has approved the following vide its meeting held on 11th & 12th of September 2017.

a. **Supervisor's Name & Designation**
   i. Prof. Dr. Sufiana Khatoon Malik
   Dean, Faculty of Social Sciences
   NUML, Islamabad.

b. **Topic of Thesis**

"SECONDARY SCHOOL TEACHERS' BELIEFS AND INSTRUCTIONAL COMPETENCE IN USING INFORMATION AND COMMUNICATION TECHNOLOGY (ICT)"

2. You may carry out research on the given topic under the guidance of your Supervisor and submit the thesis for further evaluation within the stipulated time. It is inform you that your thesis should be submit within described period by Jun 2021 positively for further necessary action please.

3. As per policy of NUML, all MPhil/PhD thesis are to be run on turnitin by QEC of NUML before being sent for evaluation. The university shall not take any responsibility for high similarity resulting due to thesis run from own sources.

4. Thesis are to be prepared strictly on NUML's format that can be had from (Coordinator, Department of Education)

Telephone No: 051-9265100-110 Ext: 2090
E-mail: snudrat@numl.edu.pk

Dr. Hukam Dad Malik
Head,
Department of Education

Cc to:
Prof. Dr. Sufiana Khatoon (Supervisor)
Dr. Saira Nudrat (Coordinator - PhD)

National University of Modern Languages
Sector H-9, P.O. Shaigan, Islamabad
Tel : 092-051-9265100-09 Fax: 092-051-9265076
Email: info@numl.edu.pk
Web: www.numl.edu.pk

Ref. No. M.L.1-3/Edu/2018

Date: 14-5-2018

TO WHOM IT MAY CONCERN

This is to certify that Ms. Alia D/O Abdul Qayyum, Registration No. 653 PhD/Edu/F16 is a bonafide student of this university. She has been granted admission in PhD Education under registration no. 653 PhD/Edu/F16 on the basis of MS/MPhil. (Educatian).

This certificate has issued on the request of student .

National University of Modern Languages Education Deptt M.S. Islamabad

Dr. Hukam Dad Malik
Head, Department of Education

National University of Modern Languages
Sector H-9, P.O. Shaigan, Islamabad
Tel : 092-051-9265100-09 Fax: 092-051-9265076
Email: info@numl.edu.pk
Web: www.numl.edu.pk

Ref. NUML-1-2/2017-FSS

Date: 11-10-2017

TO WHOM IT MAY CONCERN

This is to certify that Ms. Alia d/o Mr. Abdul Qayum, Reg. No.653-PhD/Edu/F16 is enrolled in the PhD Programme in the discipline of Education, Faculty of Social Sciences, at the National University of Modern Languages.

With a view to facilitating the candidate in gathering data for her research, you are requested to kindly provide her desired information pertaining to your organization, publications/relevant training and development material etc.

We take this opportunity to assure you that this research is a purely academic activity and the information provided by your organization will be used for research purposes only.

Attested

AMJAD ALI KHAN
Assistant Director Academics
National University of Modern Languages
Islamabad

Prof. Dr. Sufiana Khatoon Malik
Dean, Faculty of Social Sciences
11/10/2017

BOARD OF INTERMEDIATE & SECONDARY EDUCATION KOHAT
Bannu Road (Near Indus Highway Junction) Kohat. Ph # 0922-554619, 554620, 554621 Fax # 554622
ISO 9001:2015 Certified

TO WHOM IT MAY CONCERN

It is hereby certified that I have carried out proof reading of the questionnaire prepared by Ms. Alia Qayum, Researcher of PHD Education National University of Modern Languages Islamabad. I read each question minutely and guided the researcher wherever it was required.

The questionnaire is now ready for data collection.

Dr. Shaukat Hayat,
Chairman IBCC/KPBCC/BISE, Kohat

Mardan College
of
Health & Physical Education

Affiliated with
Abdul Wali Khan University
Mardan

Ref. No._____ Date_____

TO WHOM IT MAY CONCERN

It is hereby certified that I carried out proof-reading of the Questionaire prepared by Ms. Alia Qayum Researcher of PhD Education at National University of Modern Languages Islamabad. I read each question minutely and guided the Researcher where ever it was required.
The Questionaire is now ready for data collection.

Dr. Mir Alam Said
Asstt Professor in Education
Mardan College of HPE Edu
Mardan

Dr. Mir Alam Said

Banglow # 2, Khan Colony, Near Charsadda Chowk, Mardan.
Tel: 0937-866761 Mob: 0301-8303825, 0333-9848606

National University of Modern Languages, Islamabad
Department of Urdu Language & Literature

No:ML-1-5-Urdu-2022/

To Whom It May Concern

It is hereby certified that I carried our proof-reading of Urdu translation of the questionnaire prepared by Ms. Alia Qayum Researcher of PhD Education at National University of Modern Languages, Islamabad. I read each question minutely and guided the Researcher where ever it was required.

The Questionnaire in now ready for data collection.

Prof. Dr. Fouzia Aslam
Head, Department of Urdu

Chairperson
Department of Urdu
National University of Modern Languages
Islamabad

National University of Modern Languages, Islamabad
Department of Urdu Language & Literature

No:ML-1-5-Urdu-2022/

To Whom It May Concern

It is hereby certified that I carried our proof-reading of Urdu translation f the questionnaire prepared by Ms. Alia Qayum Researcher of PhD Education t National University of Modern Languages, Islamabad. I read each question inutely and guided the Researcher where ever it was required.

The Questionnaire in now ready for data collection.

Dr. Syed Badshahi Mulk
Mardan
04/07/2022

Appendix-B

صفحہ نمبر-1

سیکنڈری اسکول اساتذہ کے لیے سوالنامہ

(1) متعلقہ بلاک پر(/) کا نشان لگائیں

(01)	جنس	مرد						عورت	
(02)	سکول کی نوعیت	سرکاری						پرائیویٹ	
(03)	عمر	25 سال سے کم		25 سے 30 سال		30 سے 35 سال		35 سے 40 سال	40 سے زیادہ
(04)	تجربہ	05 سال سے کم		05 سے 10 سال		10 سے 15 سال		15 سے 20 سال	20 سے زیادہ
(05)	مضمون	انگلش	اُردو	حساب	اسلامیات لازمی	جنرل سائنس	مطالعہ پاکستان	فزکس	بائیولوجی	کمیسٹری
(06)	تعلیمی قابلیت	BA		MA		M.Phil		PhD		Others
(07)	جگہ کی نوعیت	دیہاتی					شہری			

(2) ہر سوال کو اچھی طرح اور احتیاط سے پڑھیں اور دیے گئے پیمانے کے مطابق جواب دیں۔

	آپ کس حد تک ٹیکنالوجی استعمال کرتے ہیں۔					
01	ICT کا استعمال سٹوڈنٹس سنٹر لرننگ میں مدد کرتا ہے۔	ہمیشہ	مجھے کوئی علم نہیں	اکثر	کبھی کبھار	مجھے کوئی علم نہیں
02	ICT کا استعمال کمرہ جماعت میں محدود حد تک فائدہ مند ہے۔	ہمیشہ	مجھے کوئی علم نہیں	اکثر	کبھی کبھار	مجھے کوئی علم نہیں
03	کیا آپ اپنی مضمون کی پڑھائی میں ICT کا استعمال کرتے ہیں۔	ہمیشہ	مجھے کوئی علم نہیں	اکثر	کبھی کبھار	مجھے کوئی علم نہیں
04	کیا آپ اپنی مضمون سے متعلق تعلیمی سافٹ ویئر استعمال کرتے ہیں۔	ہمیشہ	کبھی نہیں	اکثر	کبھی کبھار	مجھے کوئی علم نہیں
05	کیا آپ اپنے طلبہ کا جائزہ لینے کے لیے ICT کو استعمال کرتے ہیں۔	ہمیشہ	کبھی نہیں	اکثر	کبھی کبھار	مجھے کوئی علم نہیں
06	کیا آپ درس وتدریس میں ICT کے حوالہ جات استعمال کرتے ہیں۔	ہمیشہ	کبھی نہیں	اکثر	کبھی کبھار	مجھے کوئی علم نہیں
07	کیا آپ ICT سے متعلق تجربات دوسرے اساتذہ کے ساتھ شیئر کرتے ہیں۔	ہمیشہ	کبھی نہیں	اکثر	کبھی کبھار	مجھے کوئی علم نہیں
08	کیا آپ سبقی اشارہ بنانے میں ICT استعمال کرتے ہیں۔	ہمیشہ	کبھی نہیں	اکثر	کبھی کبھار	مجھے کوئی علم نہیں
09	کیا آپ پڑھائی کے دوران کیس سافٹ ویئر کی مدد لیتے ہیں۔	ہمیشہ	کبھی نہیں	اکثر	کبھی کبھار	مجھے کوئی علم نہیں
10	کیا آپ ای میل استعمال کرتے ہیں۔	ہمیشہ	کبھی نہیں	اکثر	کبھی کبھار	مجھے کوئی علم نہیں
11	کیا آپ طلبہ کا ریکارڈ رکھنے کے لیے کمپیوٹر استعمال کرتے ہیں۔	ہمیشہ	کبھی نہیں	اکثر	کبھی کبھار	مجھے کوئی علم نہیں
12	کیا آپ تدریسی مقاصد کے لیے کمپیوٹر لیب استعمال کرتے ہیں۔	ہمیشہ	کبھی نہیں	اکثر	کبھی کبھار	مجھے کوئی علم نہیں
13	کیا آپ کمرہ جماعت طلبہ کی انفرادی تعلیم کے لیے ICT استعمال کرتے ہیں۔	ہمیشہ	کبھی نہیں	اکثر	کبھی کبھار	مجھے کوئی علم نہیں
14	کیا آپ کمرہ جماعت میں اجتماعی سرگرمیوں کے لیے ICT استعمال کرتے ہیں۔	ہمیشہ	کبھی نہیں	اکثر	کبھی کبھار	مجھے کوئی علم نہیں
15	کیا آپ طلبہ کی کارگردگی بہتر کرنے کے لیے ICT استعمال کرتے ہیں۔	ہمیشہ	کبھی نہیں	اکثر	کبھی کبھار	مجھے کوئی علم نہیں
16	کیا آپ اپنے متعلقہ مضمون کی پڑھائی کے لیے ICT استعمال کرتے ہیں۔	ہمیشہ	کبھی نہیں	اکثر	کبھی کبھار	مجھے کوئی علم نہیں
17	کیا آپ آن لائن کورس پڑھاتے ہیں۔	ہمیشہ	کبھی نہیں	اکثر	کبھی کبھار	مجھے کوئی علم نہیں
18	کیا آپ کے خیال میں ICT سکول ماحول تبدیل کر سکتی ہے۔	ہمیشہ	کبھی نہیں	اکثر	کبھی کبھار	مجھے کوئی علم نہیں

19	کیا آپ کے خیال میں سکول میں ICT پالیسی قومی سطح پر ہونی چاہیے۔	ہمیشہ	کبھی نہیں	اکثر	کبھی کبھار	مجھے کوئی علم نہیں
20	کیا ICT پالیسی کمرہ جماعت کے سرگرمیوں کو تبدیل کر سکتا ہوں۔	ہمیشہ	کبھی نہیں	اکثر	کبھی کبھار	مجھے کوئی علم نہیں
21	آپ کس حد تک ٹیکنالوجی استعمال کرتے ہیں۔	ہمیشہ	کبھی نہیں	اکثر	کبھی کبھار	مجھے کوئی علم نہیں
22	کیا آپ روزمرہ زندگی سے متعلقہ مسائل کے حل کے لیے کمرہ جماعت میں ICT استعمال کرتے ہیں۔	ہمیشہ	کبھی نہیں	اکثر	کبھی کبھار	مجھے کوئی علم نہیں
23	کیا آپ ICT استعمال کرتے ہوئے جائزہ کے جدید طریقے استعمال کرتے ہیں۔	ہمیشہ	کبھی نہیں	اکثر	کبھی کبھار	مجھے کوئی علم نہیں
24	کیا آپ علم کے عملی استعمال میں طلبہ کی مدد کرتے ہیں۔	ہمیشہ	کبھی نہیں	اکثر	کبھی کبھار	مجھے کوئی علم نہیں
25	کیا آپ کمرہ جماعت میں Project Based سرگرمیاں کرواتے ہیں۔	ہمیشہ	کبھی نہیں	اکثر	کبھی کبھار	مجھے کوئی علم نہیں
26	کیا آپ روزمرہ زندگی کے مسائل میں پروجیکٹ بیسڈ سرگرمیاں استعمال کرتے ہیں۔	ہمیشہ	کبھی نہیں	اکثر	کبھی کبھار	مجھے کوئی علم نہیں
27	کیا آپ اپنے طلبہ کی مدد کے لیے آن لائن مواد کو ترتیب دیتے ہیں۔	ہمیشہ	کبھی نہیں	اکثر	کبھی کبھار	مجھے کوئی علم نہیں
28	کیا آپ کمرہ جماعت گروپ اجتماعی سرگرمیوں کے لیے ماحول فراہم کرتے ہیں۔	ہمیشہ	کبھی نہیں	اکثر	کبھی کبھار	مجھے کوئی علم نہیں
29	کیا آپ اپنے ساتھیوں کے ساتھ ICT کے حوالہ جات شیئر کرتے ہیں۔	ہمیشہ	کبھی نہیں	اکثر	کبھی کبھار	مجھے کوئی علم نہیں
30	کیا آپ سکول سے باہر ICT ماہرین کے ساتھ مشاورت کرتے ہیں۔	ہمیشہ	کبھی نہیں	اکثر	کبھی کبھار	مجھے کوئی علم نہیں
31	کیا آپ اپنے سکول میں ICT نافذ کرنے کے لیے کوئی پالیسی چاہتے ہیں۔	ہمیشہ	کبھی نہیں	اکثر	کبھی کبھار	مجھے کوئی علم نہیں
32	کیا آپ ICT نافذ کرنے کے لیے پالیسی کے تعارف میں اپنا کردار ادا کرنا چاہتے ہیں۔	ہمیشہ	کبھی نہیں	اکثر	کبھی کبھار	مجھے کوئی علم نہیں
33	کیا آپ طلبہ کی بولنے کی صلاحیت کو بہتر بنانے کے لیے ارادتاً ICT استعمال کرتے ہیں۔	ہمیشہ	کبھی نہیں	اکثر	کبھی کبھار	مجھے کوئی علم نہیں
34	آپ طلبہ کی علم کے تبادلے کے لیے ICT استعمال کرتے ہیں۔	ہمیشہ	کبھی نہیں	اکثر	کبھی کبھار	مجھے کوئی علم نہیں
35	کیا آپ طلبہ کے مسائل حل کرنے کے لیے مہارت حاصل کرنے میں مدد کرتے ہیں۔	ہمیشہ	کبھی نہیں	اکثر	کبھی کبھار	مجھے کوئی علم نہیں
36	کیا آپ ایسی آن لائن گریٹوٹی میں مدد کرتی ہے۔	ہمیشہ	کبھی نہیں	اکثر	کبھی کبھار	مجھے کوئی علم نہیں
37	کیا ICT طلبہ کو تعلیم یافتہ بنانے مین مدد کرتے ہے۔	ہمیشہ	کبھی نہیں	اکثر	کبھی کبھار	مجھے کوئی علم نہیں
38	کیا آپ آن لائن تعلیمی ماحول کی تردید کرتے ہوئے اپنے طلباء کی بہتری کرتے ہو۔	ہمیشہ	کبھی نہیں	اکثر	کبھی کبھار	مجھے کوئی علم نہیں
39	کیا آپ دوسرے سکولز کے ساتھ آن لائن تعلیمی رابطہ رکھتے ہیں۔	ہمیشہ	کبھی نہیں	اکثر	کبھی کبھار	مجھے کوئی علم نہیں
40	کیا آپ اپنے کمرہ جماعت میں لرننگ کمیونٹی کے طور پر انتظامات کرتے ہو۔	ہمیشہ	کبھی نہیں	اکثر	کبھی کبھار	مجھے کوئی علم نہیں
41	کیا آپ دوسرے سکولز کے مشترکہ پراجیکٹ پر کام کرتے ہے۔	ہمیشہ	کبھی نہیں	اکثر	کبھی کبھار	مجھے کوئی علم نہیں
42	کیا آپ اپنے ساتھیوں کے ساتھ آن لائن رابطہ رکھتے ہیں۔	ہمیشہ	کبھی نہیں	اکثر	کبھی کبھار	مجھے کوئی علم نہیں
43	کیا آپ اپنے سکول میں ICT کے تعارف میں مرکزی کردار ادا کرتے ہیں۔	ہمیشہ	کبھی نہیں	اکثر	کبھی کبھار	مجھے کوئی علم نہیں
44	کیا آپ کے ساتھ ICT کے استعمال میں آپ سے مدد لیتے ہیں۔	ہمیشہ	کبھی نہیں	اکثر	کبھی کبھار	مجھے کوئی علم نہیں
45	کیا دوران سروس ICT کی تربیت میں استاتذہ شرکت کرتے ہیں۔	ہمیشہ	کبھی نہیں	اکثر	کبھی کبھار	مجھے کوئی علم نہیں
46	ICT کی پالیسی کا تعارف آپ کے سکول میں کس درجے پر ہے۔	قومی سطح پر	علاقائی سطح پر	سکول کر سطح پر	مجھے پتا نہیں	کوئی اور
47	کیا آپ اپنے طلبہ سے رابطہ رکھنے کے لیے ICT کا کوئی ذریعہ استعمال کرتے ہیں۔	واٹس ایپ	ای میل	سکائیپ	ایمو	یا کوئی اور ذریعہ
48	کیا آپ طلبہ کا ریکارڈ رکھنے کے لیے ICT کا کوئی ذریعہ استعمال کرتے ہیں۔	واٹس ایپ	ای میل	سکائیپ	ایمو	یا کوئی اور ذریعہ
49	کیا آپ اپنے کمرہ جماعت میں گروہی آن لائن سرگرمیوں کا انتظام کرتے ہو۔	واٹس ایپ	ای میل	سکائیپ	ایمو	یا کوئی اور ذریعہ

50	کیا آپ بغیر کسی معاوضے کے ملنے والے تعلیمی وسائل کا استعمال کرتے ہیں۔	ایجوکیشنل ویک کوئی اور	مڈل ویب سمارٹ بریف یا کوئی بھی نہیں	لسور لائبریری		
51	کیا آپ کمپیوٹر استعمال کرتے ہو۔	ہاں	نہیں			
52	کیا آپ کے گھر میں کمپیوٹر ہے۔	ہاں	نہیں			
53	کیا آپ کے گھر میں انٹرنیٹ کی سہولت موجود ہے۔	ہاں	نہیں			
54	کیا آپ کے سکول میں کمپیوٹر لیب ہے۔	ہاں	نہیں			
55	کیا آپ کے سکول میں انٹرنیٹ کی سہولت موجود ہے۔	ہاں	نہیں			
56	کیا آپ کے پاس انڈرائیڈ موبائل ہے۔	ہاں	نہیں			
57	کیا آپ کے سکول میں UPS ہے۔	ہاں	نہیں			
58	کیا آپ کے سکول میں کمپیوٹر لیب اسٹنٹ موجود ہے۔	ہاں	نہیں			

APPENDIX- C

RE: RE: Permission for the grant of questionnaire.

From: Thaung, Nyi Nyi (nn.thaung@unesco.org)

To: hudairmdnpk@yahoo.com

Cc: a.adnan@unesco.org; f.miao@unesco.org

Date: Monday, December 4, 2017 at 01:19 AM PST

Dear Ms. Alia Qayyum,
I have contacted the responsible officer at HQ and we don't see any problem of adapting the questionnaire for an academic purpose.
You can contact directly the responsible officer at HQ, Mr Fengchun Miao (who is in Cc) if you need any further assistance.

Regards,
Nyi Nyi

United Nations
Educational, Scientific and
Cultural Organization

Nyi Nyi THAUNG (Mr)
Programme Specialist (Education)
UNESCO Islamabad
7th Floor,Serena Business Complex,
Sector G-5/1, Islamabad, **Pakistan**
Tel.: +92 51 2600242-49 (Ext:20)
Fax: +92 51 2600250
Website: www.unesco.org.pk
FB: www.facebook.com/unesco.pakistan
Twitter: @unescoisb

From: Alia Qayyum [mailto:hudairmdnpk@yahoo.com]
Sent: Saturday, December 02, 2017 9:36 AM
To: Adnan, Ahmad <a.adnan@unesco.org>
Subject: Re: RE: Permission for the grant of questionnaire.

So many thanks for response. The questionnaire can be seen on appendix-4
(UNSECO-ICT-CFT) which i have adopted and modified according to my research requirement is attached herewith, please.
On Tuesday, November 28, 2017, 10:47:07 AM GMT+5, Adnan, Ahmad <a.adnan@unesco.org> wrote:

Dear Ms. Alia Qayyum,

Could you kindly resend the questionnaire you are referring to in your earlier email please?

Kind regards,
Adnan

Adnan Ahmad
Senior Programme Assistant
Director's Office
UNESCO Pakistan
Phone +92-51-111-710-745 (Ext 15)
Direct +92-51-2600-251
Fax +92-51-2600250
Cell +92-300-8511 309
Skype: adnan.unesco

From: Alia Qayyum <hudairmdnpk@yahoo.com>
Sent: Thursday, November 23, 2017 1:11 PM
To: Liste.info.iite; UNESCO Islamabad
Cc: Dr. Sufiana Khatoon Malik; AMJAD ALI KHAN (SUPERINTENDENT)
Subject: Fw: Permission for the grant of questionnaire.

AoA,

It is requested for the early reply regarding the subject as I am waiting for the same to start my PhD thesis , please.

Alia, PhD Scholar
cell number: +9203425206170

Education Department, Faculty of Social Sciences
National University of Modern Languages (NUML

On Sunday, August 20, 2017 1:55 PM, Alia Qayyum <hudairmdnpk@yahoo.com> wrote:

Dear Sir/ Madam,
I hope this email will find you in good health.
I submit here that I am PhD student and I belong to Khaiber Pukhtoon Khawah (KPK). I am working on assessing teachers ICT competence in KPK. The questionnaire of UNESCO is attached in this email. I want to adapt this questionnaire in my research as I have to adjust and modify it as per objectives and local context of my research. It is requested to allow me to use questionnaire of UNESCO and modify it as per my local and research requirements.
Kind regards,
Alia, PhD Scholar
cell number: +9203425206170

Education Department, Faculty of Social Sciences
National University of Modern Languages (NUML)

RE: Permission for the grant of questionnaire.

From: Adnan, Ahmad (a.adnan@unesco.org)

To: hudairmdnpk@yahoo.com

Cc: nn.thaung@unesco.org

Date: Monday, November 27, 2017 at 09:47 PM PST

Dear Ms. Alia Qayyum,

Could you kindly resend the questionnaire you are referring to in your earlier email please?

Kind regards,
Adnan

Adnan Ahmad
Senior Programme Assistant
Director's Office
UNESCO Pakistan
Phone +92-51-111-710-745 (Ext 15)
Direct +92-51-2600-251
Fax +92-51-2600250
Cell +92-300-8511 309
Skype: adnan.unesco

From: Alia Qayyum <hudairmdnpk@yahoo.com>
Sent: Thursday, November 23, 2017 1:11 PM
To: Liste.info.iite; UNESCO Islamabad
Cc: Dr. Sufiana Khatoon Malik; AMJAD ALI KHAN (SUPERINTENDENT)
Subject: Fw: Permission for the grant of questionnaire.

AoA,

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cell number: +9203425206170

Education Department, Faculty of Social Sciences
National University of Modern Languages (NUML

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The questionnaire of UNESCO is attached in this email. I want to adapt this questionnaire in my research as I have to adjust and modify it as per objectives and local context of my research. It is requested to allow me to use questionnaire of UNESCO and modify it as per my local and research requirements.
Kind regards,

Alia, PhD Scholar
cell number: +9203425206170

Education Department, Faculty of Social Sciences
National University of Modern Languages (NUML)

Re: Permission to start Pilot Data Collection - Alia, PhD Education (Fall-2016)

From: Dr. Sufiana Khatoon Malik (skhatoon@numl.edu.pk)

To: hudairmdnpk@yahoo.com

Date: Thursday, November 23, 2017 at 03:15 PM PST

Dear Scholar,
It was good effort!
However, you can ask them to write these word and give to you. So that you have proof of it that it is public. Go ahead for pilot testing and in next meeting you have to request in writing and they will reply u in writing.

With Best Regards,
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On 23 November 2017 at 18:15, Alia Qayyum <hudairmdnpk@yahoo.com> wrote:

> Salam
> Respected Madam,
> Hope you will be fine.Today at 2'oclock dated 23 November 2017 I visited there in UNESCO office located in Serena Business Complex and met there with NationalPprogram Officers (Education) Mr. Zafar Hayat Malik and his colleague Ms. Alina regarding permission for the use of questionnaire developed by UNESCO-ICT-CFT to modify it according to my research Dissertation. we thoroughly discussed the required purpose for the questionnaire and they both replayed/suggested that its a public document and there is no need of any kind of permission.
>
> Now I want to start a pilot data collection on the questionnaire developed by me taking guidelines from UNESCO-ICT-CFT questionnaire. As I become late waiting for receiving the response from UNESCO office. Madam; it is requested to convey me that how much filled questionnaire will fulfill the pilot project status, My sample of the study is 500 secondary school teachers (SST).
>
> Alia,
> PhD Scholar (Education)