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**Strathclyde**  
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**A comparative study of secondary school teachers' integration of ICT into their  
pedagogical practices in Egypt and Scotland**

A thesis submitted in the fulfilment of the requirements for the degree of

**Doctor of Philosophy in Education**

**By**

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## **Abstract**

Integration of information and communication technology (ICT) at secondary education has become an innovative approach to improve learning , promote digital literacy, and get pupils ready for a technologically driven future. ICT can also be considered as one of the main pillars of the educational reform as technology competencies and digital literacy have become an essential prerequisite for global competitiveness. Egypt and Scotland share this vision and have similar goals that are related to ICT integration at secondary education. Both countries acknowledge that ICT integration can develop secondary education and promote equity, inclusion, and creativity. Both countries have launched different ICT projects that provide teachers and pupils at secondary schools with educational technologies such as iPads/tablets and laptops. These projects aim to help teachers and pupils benefit from these technological innovations in the development of the teaching and learning process. Nevertheless, the unique characteristics of each country have shaped the outcomes of these ICT projects in education, in general, and at secondary education, in particular. Though Scotland was able to abolish most of the barriers that could hinder the process of ICT integration in education, these barriers still, to some extent, exist in Egypt.

The present research is, to the best of my knowledge, the first study that investigates ICT integration at secondary education in Egypt and Scotland. It aims to 1) investigate how these differences have affected the experiences of secondary school teachers with ICT integration in both countries, 2) how each country managed to overcome the shortcomings, and 3) what are the considerations of each country for future developments in their education systems. It compares the experiences of secondary school teachers with ICT integration in Egypt and Scotland. Each country holds fundamental differences in the socio-economic circumstances, infrastructure capabilities, cultural norms, and policy approaches. The present research lends the lens of secondary school teachers in Egypt and Scotland to understand

their experiences in integrating ICT in their teaching practices. Participants were twenty secondary school teachers: twelve from Egypt and eight from Scotland. Participants teach different subjects such as English, French, Biology, Physics, Mathematics, computer sciences, and Social Studies. They have considerable teaching experience that ranges between two to thirty years.

Findings revealed a number of interesting results that distinguish the process of ICT integration in Egypt and Scotland and explain the effect of ICT implementation at secondary education. Participants considered ICT integration an opportunity for them to develop their teaching practices, however they perceived a number of factors that have positively and/or negatively affected their ability to integrate ICT into their teaching practices. These factors are a) the implementation of relevant ICT policies at initial teacher education programmes, b) schools' digital infrastructure, c) and teachers' professional development programmes as well.

In Egypt, findings revealed that ICT integration at secondary schools in Egypt was limited. Participants regarded it as a burden rather than a development tool. Findings showed that stakeholders focused heavily on providing secondary schools with ICT technologies rather than abolishing the barriers could hinder this process. Secondary school teachers in Egypt did not have the opportunity to integrate ICT in their teaching practices due to several conditions that made ICT integration a complicated process. Participants perceived Teacher Education (ITE) as one of the primary barriers to integrate ICT in education. ICT is not integrated in the curriculum of ITE programmes as pre-service teachers study it as a stand-alone module that is more theoretical than practical. Curriculum at secondary education is not linked to the curriculum of ITE programmes. Infrastructure at secondary schools suffer from several issues such as shortage of school buildings, overcrowded classrooms, limited internet access and power supply interruptions. Classrooms are always overcrowded with an average

of fifty pupils in each classroom. These issues have hindered secondary school teachers from employing ICT technologies such as interactive boards in different learning activities.

Furthermore, findings revealed that the provision of professional development in Egypt did not fulfil participants' aspirations to understand the proper practices of ICT integration in their teaching practices. Participants reported that they lack the appropriate pedagogical training and technical skills that are required to integrate ICT into their teaching practices successfully. They said that teachers' professional development programmes emphasized on developing their essential technical skills in favour of sophisticated digital pedagogy.

Therefore, ICT integration did not yet result in tangible reform at secondary education in Egypt.

On the contrary, policy makers in Scotland managed to pave the way for better ICT integration at secondary education. Findings showed that the continuous review of ICT policies implementation and the reform of ITE programmes have supported the success of ICT integration in Scotland. The structure of Initial teacher education (ITE) was one of the supportive factors in this success. Tertiary institutes have linked the secondary education curriculum (i.e., Curriculum for Excellence (CfE) ) to the curriculum of ITE programmes. ICT was an essential element that pre-service teachers practiced while studying the different areas that are covered by the CfE. Thus, secondary school teachers in Scotland had the opportunity to understand the essential role of ICT in their teaching practices and to employ ICT during the school placements . Findings revealed that the availability of ICT tools in the classrooms was reported to be beneficial for participants in Scotland. Findings showed that secondary schools in Scotland have a reliable infrastructure with stable internet connectivity and power supply. Findings also showed that secondary schools in Scotland did not suffer from shortage of school buildings or overcrowded classrooms. The current average number of pupils in the classroom is 25 pupils. Teachers' professional development programmes

were well-established with a robust framework. Policy makers have considered digital competency a fundamental part of teaching standards to ensure that secondary school teachers are well prepared to integrate ICT in their teaching practices. Participants reported that these programmes have enabled them to develop their teaching professionalism and enhance their self-confidence in technology skills. Thus, it can be said that findings showed that participants' professional development in Scotland was significantly better than Egypt.

**Key Words:** Egypt, Scotland, Education Technology, ICT integration; initial teacher education; technical support; ICT policy; TPACK; TAM; UATAUT; CPD; CLPL.

## **Dedication**

To my late father (**Mohamed**), I still can hear the best wishes of success you have whispered in my ears. I wish you were alive to see this glorious moment. Rest in peace, I have achieved what you have always encouraged me to do.

To my beloved mother (**Bahia**), Your smiles give me endless hopes for better future. You have been supporting me since day one. I pray to Allah that you get better soon.

To my sweetheart, my wife (**Samira**), who has been standing by me during this long journey. I thank Allah who has blessed me with a kind-hearted angel like you. Loads of love to you.

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(يَرْفَعُ اللَّهُ الَّذِينَ آمَنُوا مِنْكُمْ وَالَّذِينَ أُوتُوا الْعِلْمَ دَرَجَاتٍ)

*(ALLAH WILL EXALT IN DEGREE THOSE OF YOU WHO BELIEVE AND HAVE BEEN  
GRANTED KNOWLEDGE.)*

All praise to Allah, the Almighty, for the plentiful blessings that enabled me to accomplish this work. The past years have been a long journey into intellectual works to excavate experiences of others in the field of education technology. It was an ignition of my thoughts and ideas that were interpreted into this research. This was not a sole effort of my own. Others have shared their efforts for the accomplishment of this research. I have been blessed with a talented team of supervisors whom I send my grateful thanks and appreciations.

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## **List of Abbreviations**

BBC	British Broadcasting Corporation
BEd	Bachelor of Education
CAI	Computer Assisted Instruction
CAMPAS	Central Agency for Public Mobilization and Statis
CBT	Computer Based Training
CfE	Curriculum for Excellence
CIP	Cognitive Influence Process
CK	Content Knowledge
CLPL	Career-Long Professional Learning
CPD	Continuous Professional Development
ECA	Economic Commission for Africa
EKB	Egyptian Knowledge Bank
ES	Education Scotland
ERTU	Egyptian Radio and Television Union
GTCS	General Teaching Council for Scotland
HEI	Higher Education Institutes
IBT	Internet-Based Training
ICT	Information and Communication Technology
IT	Information technology
ITE	Initial Teacher Education
LMS	Learning Management Systems
MCIT	Ministry of Communication, and Information Technology
MEd	Master of Education

MoETE	Ministry of Education and Technical Education
MoHESR	Ministry of Higher Education and Scientific Research
NGfL	National Grid for Learning
PCK	Pedagogical Content Knowledge frame
PeoU	Perceived ease of use
PGD	Post Graduate Diploma
PGDE	Post Graduate Diploma of Education
PI	Programme Instruction
PK	Pedagogy knowledge
PU	Perceived usefulness
SIP	Social influence process
SLT	Senior Leaders Team
SN	Subjective Norm
SWAN	Scottish Wide Area Network
TAM	Technology Acceptance Model
TCK	Technological Content Knowledge
TK	Technology knowledge
TPACK	Technology, Pedagogy, Content Knowledge
TPK	Technological Pedagogical Knowledge
TRA	Theory of Reasoned Action
TQ	Teacher Qualification
UTAUT	Unified Theory of Acceptance and Use of Technology
UNESCO	The United Nations Educational, Scientific and Cultural Organisation
WWW	World Wide Web
ZDP	Zone of proximal development

## **Chapter One**

### **Introduction**

#### **1.0 Background of the study**

Education can significantly affect the development of a country's economy and the enhancement of its citizens' learning competencies (Madani, 2019). The effect of education on can be noticed in the better employment opportunities, higher income, and prosperous lifestyle individuals can enjoy (Audit Scotland, 2021). This, in return, can lead to a stable and cohesive society and reduce the level of poverty as well (Education Scotland, 2014; Barakabitze et al., 2019). ICT technologies at present form an integral part of teaching and learning practices that can develop teachers' teaching skills and improve pupils' academic performance (Shulla et al., 2020). Therefore, education stakeholders around the globe have sought to introduce information and communication technologies (ICT) into education to help teachers develop pupils' academic performance.

The goal behind the adoption of ICT in education is a two-fold. It aims to provide teachers with aiding tools to facilitate the delivery of meaningful teaching practices. It also offers pupils an opportunity to develop their digital skills and improve their creative thinking (Bai et al., 2016). Embedding ICT into the different areas of the curriculum supports teachers' efforts to provide pupils with meaningful learning experiences (Ainley, 2018). It enables teachers to adopt more collaborative pupil- centred teaching strategies (Fernández-Gutiérrez et al., 2020) and devise interactive learning activities that increase pupils' level of interaction and develop their level of creativity (Ghavifekr et al., 2015). Utilising ICT into teaching practices also enables teachers to adopt constructive learning approaches that provide pupils more freedom in acquiring knowledge (Serin, 2018; Goh & Sigala, 2020). These approaches depend on designing effective and creative learning activities that increase

pupils' engagement and enable them to structure their learning (Hidayati, 2016). Therefore, the role of teachers and pupils is fundamental in the reform plans of education as they are the users and utilisers of ICT in the teaching and learning activities and, thus, their involvement in the integration process is essential to its success (Mirzajani et al., 2016; Drossel et al., 2017).

Developing teachers' technology skills helps them utilising ICT technologies in their pedagogical practices and, in return, shifting from teacher-centred approaches to a more pupil-centred approaches (Albugami & Ahmed, 2015). This change could lead to further responsibilities for teachers such as the implementation of new teaching strategies and re-designing the instructional activities to adapt with ICT (Ekberg & Gao, 2018; Lawrence & Tar, 2018). Though teachers may consider this change as an extra burden for them, however the positive side is that the utilisation of these technologies is an opportunity for them to enhance their teaching practices (Al-Rahmi et al., 2020). It is also significant to help pupils to understand how the utilisation of ICT can provide them with better learning experiences. Pupils should recognise the role of ICT in enhancing the level of interaction with their teachers and peers which, in return, increases their retention and enhances their creative thinking. The display of videos/movies, graphs, and presentations can invigorate their sensory motors, improve their critical thinking skills, and make their learning experiences more conducive (Firth et al., 2021). ICT can also empower pupils' positive role in structuring their learning (Ishaq et al., 2020). It can enable them to build efficient communication with their peers, teachers, and parents as well. Pupils' continuous use of interactive learning activities empowers collaborative learning and teamwork with their peers (Kontostavlou & Drigas, 2019). Working in groups enables them to brainstorm solutions for problems, submits creative ideas, and forms new knowledge of reality (Licorish et al., 2018). Assistive ICT technologies such as screen readers and adaptive keyboards/mouses can provide pupils with

learning needs the opportunity to benefit from ICT integration into learning as well (Ahmed, 2018; McNicholl et al., 2021). The features of these assistive technologies enable them to actively engage into the learning activities and interact with their peers and teachers as well (Atanga et al., 2020). Furthermore, ICT enables teachers to track pupils' individual learning needs and support those of low level and those who need further support. Consequently, it increases the level of interaction with other peers and their teachers and makes pupils feel they are in control of their learning (Nikou, 2023).

The sophisticated nature of ICT technologies provides pupils with a self-paced learning tool that enables them to process, gather, find, classify, organise, analyse, and evaluate information in a quick and logic ways (Ishaq et al., 2020). This, in return, improves the quality of education and supports the development of pupils' ICT literacy and numeracy skills (Das, 2019). Furthermore, ICT technologies are environment friendly and have greener effect that helps in reducing the level of carbon emission that may affect teachers and pupils' health (Batool et al., 2019; Prasetyo et al., 2020; Al- Rahmi et al., 2020). According to Humes and Priestley (2021) developed and developing countries provide schools and universities with computers, laptops, iPads/Tablets, smartboards, and e-Learning platforms as part of their plans for the continuous reform of their education system. This justifies the current global tendency to integrate ICT into education to develop teachers' technology skills and improve pupils' learning performance (Alam, 2022; Sakamoto, 2018; Cha et al., 2020). It also supports the vision of Egypt and Scotland about the significant role of ICT in developing their education system for a better future for their young people (Scottish Govt, 2022; Badran et al., 2021).

The vision of the Ministry of Education and Technical Education (MoETE) in Egypt is underpinned by the notion that ICT is a key element in supporting education development, expanding scientific research, and improving teaching and learning experiences (Badran et

al., 2021). The MoETE perceives ICT as an effective tool that can support the achievement of the country's educational and economic goals (MoETE, 2014; UNESCO,2023). In Egypt, the Ministry of Communication and Information Technology (MCIT) is the responsible organisation that supervises the implementation of ICT in all the country's sectors of business and education as well. The MCIT (2009) identified three objectives for the national ICT programme. These objectives are to: "identify and promote ways in which ICT can enhance the reach and quality of education; to empower teachers, educators, principals, and administrators with ICT tools; and to promote greater access to ICT tools for educators and students" (p.22). In cooperation with MCIT, MoETE introduced "Manahel Al Maarifah"- (Sources of Knowledge )as the first ICT project at secondary schools in the 1990s. Through this project, the MoETE provided secondary schools with multimedia suites that were equipped with desk-top computers, overhead projectors, display screens, video recorders, and satellite TVs (Pouezevara et al., 2014; Rizk & Kamel, 2013). After that in 2013, the MoETE launched the educational *tablet* project as the first portable technology project for secondary education. The project started as a pilot project in some of the low-populated governorates to define the effect of this portable technology on the development of pupils' academic performance at secondary education (Adel Ali & Arshad, 2018). MoETE anticipated that this type of portable technology could enhance teachers' pedagogical practices and improve pupils' academic results as well. The project also aimed to reduce the cost of textbooks that MoETE provides to secondary school pupils and replace them with electronic books in a later stage. However, several factors have affected the success of this project, and the expected results are far beyond the declared vision. Factors such the modest digital infrastructure at secondary schools in addition to the low level of teachers' technology skills due to inappropriate training courses have led to the collapse of this pilot project (Adel Ali & Arshad, 2018; El Tawil, 2018; Aditya, 2021). In 2018, the MoETE have expanded the ICT

projects at secondary education. Interactive boards were installed at classrooms in secondary education around the country to replace the traditional black/white boards. Furthermore, the MoETE resumed the *tablet* project on a larger scale where every teacher and pupil at secondary schools across the country have received a free *tablet* (Ahram, 2018). Furthermore, the MoETE inaugurated the Egyptian Knowledge Bank (EKB) to support these projects. The EKB provides teachers and pupils free access to a huge electronic repository of educational resources, and scientific journals. Teachers can use EKB to enrich their teaching practices with interactive learning supplementary materials while pupils can use it to watch educational videos, review previous quizzes and exams in addition to conducting research projects (Abdullah, 2022). The MoETE's goals behind all these projects were to provide teachers and pupils the opportunity to employ educational technology in the classroom rather than being restricted into the multimedia suites of Manahil Al Maarifah and (Amer, 2020).

In Scotland, the Scottish Government has also offered great attention to the integration of ICT at secondary schools. The Scottish Government recognises ICT as an effective tool that can significantly enhance secondary education (Education Scotland, 2014; Tut et al., 2021). Scotland's first educational policy- *Skills for Scotland: A Lifelong Skills Strategy*- perceives ICT a key element that can support teachers to deliver meaningful teaching and help pupils improving their essential cognitive skills (Scottish Govt, 2007; Scottish Govt, 2016). The Scottish Government states in its vision about ICT integration in education that "Scotland's educators, learners and parents take full advantage of the opportunities offered by technology in order to raise attainment, ambition and opportunities for all." (Scottish Govt, 2016, p.2). Therefore, the Scottish Government have provided secondary schools with ICT technologies, internet connection, professional development, and technical support to ensure the success of ICT integration (Humes & Priestley, 2021; Brown et al., 2021). Early in the 1990s, the UK government funded the National Grid for Learning



(NGfL) and the superhighway internet connection at schools (Selwyn, 2000). NGfL was an online learning platform across the UK that provided teachers and pupils with massive educational sources.

The Scottish Government has also funded several ICT initiatives to support the integration of educational technology at schools (Institute of Education, 2006). Since the 1980s, schools have had computers suites that teachers used to teach the principles of computing. After that, the Scottish government have provided secondary schools with desktop computers and smartboards in the classrooms. Furthermore, many City Councils around Scotland, have recently provided teachers and pupils at secondary education with laptops, Chromebooks, and iPads/tables. In 2007, the Scottish Government launched the online platform *Glow* to replace the NGfL (Admiraal et al., 2021). *Glow* is Scotland's intranet that connects all schools ( primary and secondary) around the country. According to Education Scotland (2014), *Glow* offers teachers and pupils a set of combined online tools and resources, email addresses, and virtual learning environments. These tools enable teachers and pupils to “use the facilities provided by *Glow* to good effect, to support learning in a range of effective ways” (p.21). *Glow*'s digital resources also enable teachers to improve their teaching practices and design different learning activities to increase pupils' level of engagement. For example, *Glow* offers pupils and teachers unlimited cloud storage to create, store, and share useful learning resources at school and home (Education Scotland, 2017). Through *Glow*, pupils can post to teachers their homework and /or research projects to comment, check, and mark them. *Glow* also offers teachers and educators the opportunity to form learning forums and blogs to discuss and share their opinions about the best possible methods to develop the curriculum and the best teaching approaches and practices (Audit Scotland, 2021). Furthermore, *Glow* hosts digital learning hubs that provide innovative methods to improve teachers' professional development and pupils' learning experiences.

## **1.1 The Research Question**

The present study investigates the experiences of secondary school teachers in Egypt and Scotland with ICT integration in their pedagogical practices. It compares their experiences in integrating ICT in their teaching practices to reveal the hindering and supporting factors they have confronted during this process. To fulfil this purpose, I identified the below objectives:

- To investigate the current situation of ICT integration at secondary schools in Egypt and Scotland
- To identify the factors that support secondary school teachers to integrate ICT in their teaching practices.
- To identify the factors that impede secondary school teachers to integrate ICT in their teaching practices.
- To define the similarities and differences between teachers' pedagogical practices in Egypt and Scotland.

Revealing these factors should provide an explanation of the existing similarities and differences between Egypt and Scotland with regard to ICT integration at secondary education.

## **1.2 Key outcomes**

Several studies confirmed that secondary school teachers in Egypt and Scotland have access to ICT technologies such as smart and interactive boards in the classroom in addition to portable technology such as iPads, tablets, laptops and Chromebooks (see for example, Rizk & Kamel, 2013; Badran et al., 2021; Hart-Anderson & Holme, 2023; Tut et al., 2021). The Egyptian Government has allocated considerable investments to develop ICT integration at pre-university education, in general, and secondary education in particular. However, it is noticed that these investments focused heavily on the provision of ICT technologies at schools while factors that form impediments to ICT integration are yet to be eradicated. Initial Teacher Education (ITE) programmes which is the main source of teacher education

still adopts outdated curriculum that does not support ICT integration. This curriculum is not linked to the curriculum of secondary education as well (El-Bilawi & Nasser, 2017; Ahmed & Sayed, 2021). School placements are not long enough to support pre-service teachers' aspirations in gaining sufficient practical teaching experiences. Therefore, novice teachers face challenges once they begin their teaching profession (El-Halawany, 2018). Furthermore, secondary schools suffers from overpopulated classrooms and severe shortage of school buildings and teaching staff as well (El-Sayad et al., 2021). Secondary school teachers have access to advanced interactive boards in the classrooms and student has access portable technology (i.e., *tablets*), however these classrooms suffer from drastic conditions. The current student to teacher ratio at secondary schools is 1:22 and the average classroom accommodates a minimum of 41 student and could even increase to 50 pupils or more in some of the densely populated cities (Central Agency for Public Mobilization and Statistics-CAMPAS, 2024). This high density affects the efficiency of the digital infrastructure and results in hygiene, ventilation, and wellbeing issues (Bolbol et al., 2017). Curriculum of secondary education depends greatly on rote learning where final exams is the sole assessment tool for pupils' comprehension of the subject matter and the gateway to access tertiary education (Badran et al., 2021). Teachers' professional training programmes in Egypt and Scotland is, also, one of the key outcomes of the present research. In Egypt, these programmes is one of the persistent concerns in its educational system (El-Bilawi & Nasser 2017). These programmes are, normally, structured to expand teachers' knowledge about the subject/s they teach and the role of ICTs in delivering the content meaningfully. However, the majority of these programmes lack the adequate knowledge that can support teachers and help them utilising ICT in their teaching practices. Furthermore, the aforementioned factors could have supported the proper ICT integration at secondary education presuming that

MoETE have adopted an innovative curriculum that allows technology infusion into the different areas of the subject content

By way of contrast, Scotland have taken the various measurements to diminish the factors that could hinder ICT integration. It is noticed that secondary school teachers in Scotland enjoy better conditions than their counterparts in Egypt. The pupils to teacher ratio in secondary schools is 1-12.5 and the average classroom accommodates between twenty to twenty-five pupils and in limited cases thirty-three pupils (Scottish Govt, 2023). Pre-service teachers study the latest pedagogical theories and are able to develop their ICT skills through in-class and on-line courses (Beck & Adams, 2020). They further develop these skills and learn how to implement theory into practice during the long school placements. These long placements provide them enough time to observe how expert teachers use ICT to teach and conduct interactive learning activities. The Curriculum for Excellence (CfE), which is Scotland's national curriculum, is a further factor that supports pre-service teachers' experiences with ICT integration (Beck, 2019; Scottish Govt, 2008). ITE programmes in Scotland focus on teaching pre-service teachers the different areas covered in the CfE and how to infuse technology in its different areas. Career-Long Professional Learning (CLPL) programmes in Scotland focus on the development of teachers' teaching and ICT skills. These programmes scaffold in-service teachers with the up-to-date information about recent trends in teaching and learning and how to effectively integrate ICT in the learning activities that support pupils' academic development. Therefore, pre-service, and in-service teachers in Scotland are able to accumulate experiences about the vital role of ICT in empowering their teaching practices and enhancing pupils' academic performance (Priestley & Humes, 2010; Priestley et al., 2015).

### 1.3 Significance of the research

The role of ICT in developing education is well documented in literature. There are several studies that have discussed this issue and provided evidence about the significant role of ICT in enhancing teaching and learning practices. (see for example, Albugami & Ahmed, 2015; Al-Rahmi et al., 2020; Andyani et al., 2020; Aziz, 2020; Bai et al., 2016; Barakabitze et al., 2019). These studies and others have investigated this issue from different perspectives to provide an understanding of the significance of integrating ICT into teachers' pedagogical practices. However, there is not to the best of my knowledge any study that have compared secondary school teachers' experiences with ICT integration in Egypt and Scotland. As mentioned earlier, there are similarities between both countries in regard to ICT integration projects they have adopted. Both countries have drafted their ICT policies and provided secondary schools with ICT technology in almost the same period. However, there are also recognisable differences in integrating ICT into secondary schools between the two countries. Though Egypt has placed immense investments to provide ICT at secondary schools, the effect of ICT integration on secondary education outcomes is still beyond expectations. Barriers such as schools' digital infrastructure, overcrowded classrooms, and ITE programmes still need to be addressed. The effect of these barriers on integrating ICT at secondary schools may affect the sustainability of ICT projects and restrain their immediate and /or long-term effect on the development of education. Conversely, Scotland was able to abolish many of the aforementioned barriers and provided secondary schools with better digital infrastructure and low populated classrooms. Universities and Higher Education Institutions are also providing pre-service teachers with ITE programmes that address the country' reform plans for better education. These efforts put the Scottish education systems (i.e., pre-university and tertiary) into advanced rank and a global reputation that inspired different countries to adopt or transfer it into their local system of education.

Thus, the present study is an attempt to understand how different educational contexts influence the integration and utilisation of ICT at secondary education. It highlights the role that ICT can play in bridging gaps at secondary education and enhancing equity as well. It is an intensive investigation of the difficulties, approaches, and results of ICT integration at secondary education in two different countries with unique socio-economic, cultural backgrounds, and different structure of the education systems. The study emphasizes the significance of context-specific ICT integration approaches that focus on access and quality of ICT by comparing Egypt's developing educational system with Scotland's well-established and developed system. Through the analysis and comparison of these two countries, the study sheds light on the various ways that ICT is being used to improve educational outcomes and the obstacles that teachers have experienced in two different educational settings. In addition to highlighting the unique difficulties and achievements in each country, this comparative framework can be considered as a model for drafting ICT policies that fulfil each country's educational aspirations. Furthermore, the comparative approach of this study provides a ground for long-term ICT integration by identifying digital infrastructure, initial teacher education, and teachers' professional development as essential elements for the effective utilisation of technology at secondary education. This paradigm encourages a deliberate and sustainable approach to ICT integration at secondary education that could be implemented globally. This unique position makes the present research significant to stakeholders in both countries.

#### **1.4 Structure of the thesis**

This thesis has four chapters in addition to this introductory chapter. Chapter two reviews the related literature about ICT integration in education. The chapter is divided into five sections in addition to a brief introduction. These sections provide detailed discussion about the significance of ICT integration on the development teaching and learning. The first

section provides a historical background about the development stages of ICT technologies and how these developments have affected the development of education. The second section highlights the prominent learning theories and discusses the contribution of these theories to the integration of ICT in teaching and learning . The third section discusses ICT integration frameworks and models. The section defines the role of these frameworks and models in defining the knowledge required to develop teachers' pedagogical and technological skills in addition to the factors that could affect the process of ICT integration in education. The following section explores teachers and pupils' perspectives of the role of ICT in the development of teaching and learning. The final section investigates the factors that could affect the success or failure of ICT integration in education. The chapter ends with a brief summary that wraps up the ideas presented in the chapter.

Chapter three focuses on the methodological paradigms that are used in this research. The chapter has nine sections. The first section discusses the rationale for the present research then followed by a discussion about the development of the research questions. The ontological and epistemological issues that establish the philosophical stances of the research are discussed in the third section. The fourth section defines the recruitment procedures, the type of sampling used in this research, the number of participants, their characteristics, in addition to the recruitment strategy. The data collection method is the fifth section of this chapter. It explores the type of data collection and describes its design and structure. It also explains the pilot study and provides justifications for conducting it. The research ethics section is the following section. It defines the procedures the researcher has followed to obtain the ethics committee's approval, and the measurements applied to protect participants' confidentiality. The seventh section discusses the protocols the researcher has followed to conduct the interviews and also discusses the effects of the Covid-19 pandemic on these protocols. The section to follow presents the data analysis approach employed in the research

to check and analyse the data. The final section discusses the validity and trustworthiness measurements researcher has followed to ensure the quality of research and support the findings.

Chapter four presents the research findings that emerged from the data analysis. The first section revisits the research questions and defines the themes emerged from data analysis. The subsequent sections present each theme and its subordinate themes. The analysis of the data produced a number of themes that were grouped into three main themes in addition to their subordinate themes under the umbrella of the overarching theme. The chapter provides an in-depth description of these themes, and the findings related to each theme to provide answers to the research questions. The overarching theme resembles the focal point of the research question while the other themes explain participants' experiences of ICT integration into their teaching practices and their perspectives of the factors that affect the integration process.

Chapter five is the last chapter of this thesis. The chapter consists of eight sections. The first section is an introduction that presents the research questions and briefs the findings that will be discussed in the following sections. The second, third and fourth sections presents the factors revealed from the study findings and discuss their effect on ICT integration in Egypt and Scotland. The fifth section presents the conclusions drawn from the findings and the contribution of the present research to knowledge. The sixth section is the recommendations section which provides a number of thoughts for policy makers in Egypt and Scotland to enhance ICT integration at secondary education. The seventh section explain the limitations of the present study while the final section is about the need for further research in future to support ICT integration in teaching and learning.



In the coming chapter, I will review the literature related to this research and critically discuss the earlier studies about ICT integration and its effect on the development of education.

## **Chapter Two**

### **Literature Review**

#### **2.0 Introduction**

This chapter reviews the related literature to ICT integration in education. To understand the significance of ICT integration in education, it is essential to review the gradual stages of ICT development, learning theories, ICT frameworks and models. These aspects help in defining the factors that can positively and/or negatively affect ICT integration in education. The gradual development of ICT portrays the significance of these tools and how they have enabled teachers to employ them in their teaching practices to enhance pupils' academic performance. Proponents of learning theories such as constructivism, behaviourism, and cognitivism have theorised the effect of ICT integration on the development of education. Though these theories have different approaches in implementing ICT in education, however their contributions have enriched the development of several teaching and learning approaches. ICT frameworks and modules also have a significant role in understanding the role of ICT integration in developing education. The TPACK framework is considered as one of the prominent frameworks that that explains the essential knowledge that pre-service teachers need to know to, successfully, adopt ICT in their teaching practices. It is also documented that this framework can help in-service teachers improving their existing knowledge of pedagogy and technology. However, teachers need to understand how to implement this knowledge in their classroom practices. The Technology Acceptance Model (TAM) and the Unified Theory of Acceptance and Use of Technology (UTAUT) models can support teachers in this regard as they define the factors that motivate users to accept or decline ICT integration.

## 2.1 ICT history in Education

The implementation of ICT in education can be traced back to the early decades of the 20<sup>th</sup> century (Kaware & Sain, 2015). Technologies such as radio, television, and telephone have been, and are still, used around the world as methods of delivering the educational content (Pregowska et al., 2021). Scholars have discussed the significant role of radio and television in the development of education. Sarmah and Lama (2017) posited that radio and television have facilitated a type of formal and informal educational programmes that aimed to bridge the gap between pupils in rural and urban areas. Anderson & Subrahmanyam, (2017) found that televised educational programmes have positively impacted the development of pupils' cognitive skills and the improvement of their academic performance.

The British Broadcasting Corporation (BBC) in the UK and the Egyptian Radio and Television Union (ERTU) in Egypt are examples of this (Allam, 2018). Since it was established in 1920, the BBC has broadcasted several educational contents that addressed the curriculum of primary and secondary education (Jones, 2021; Boyd, 1977). In 1957, the BBC TV service started to broadcast different educational programmes such as “Science Helps the Doctor” and “Living in the Commonwealth”. Pupils were able to follow these programmes during the school day and at home as well (Barclay, 2022). Furthermore, the BBC also produced famous learning programmes such as “Let’s talk English” and “English for You” to help speakers of other languages developing their English language skills (Barclay, 2023). Once the internet service was available to public in the 1990s, the BBC launched the “Bitesize” website as an online resource of study that supports teachers’ teaching practices and pupils’ learning needs (Hoare, 2021).

Radio broadcast services in Egypt started a decade after BBC. The early educational broadcast started in the 1960s and focused on the eradication of illiteracy for those who live in the deprived areas and adults who never had the chance to join schools (Badr, 2021). These

programmes provided the targeted audience with the basis of writing and reading in addition to learning simple mathematics. Nwokedi et al. (2023) contended that radio and television can be used as formal and informal educational methods that are directed to the population living in the deprived or remote areas. Zhang et al. (2023) studied the effect of radio broadcast on the development of language learning. They found that the spread of media broadcasts supported large audience's efforts in learning foreign languages and other life skills. In the mid of the 1990s, the Egyptian television service launched the Nile TV educational channels. The primary goal of these channels was to stream educational programmes that cover the different areas of the secondary education curriculum (Allam, 2018). After that, these channels expanded these programmes to cover the curricula of pre-university and university education as well. In 2008, the Ministry of Education and Technical Education (MoETE) launched the first online educational portal: *Schools*. Similar to the BBC's *Bitesize*, the *Schools* portals provided supplementary audio/video activities to help pupils understand lessons and become prepared for final exams (MoETE, 2014).

The introduction of personal computers in the 1970s has enabled schools and universities to utilise ICT tools that have more advanced and interactive features that can help teachers and pupils to store and retrieve information (Zawacki-Richter & Latchem, 2018). Furthermore, the availability of the internet service to the public on the World Wide Web (WWW) increased the interest of the educational stakeholders around the world to adopt ICT technologies in education. Leinonen (2005) have traced the history of ICT development and its employment in education and summarised it into the following five phases:

- The 1970s to early 1980s phase: This phase was the drill and practice phase that aimed to teach pupils computer programming and develop their logic and math skills.
- The 1980s to early 1990s phase: This phase witnessed the emergence of computer-based training (CBT). CBT depended on providing a more attractive version of

computers through multimedia resources such as CDs. Computers at this phase came with advanced graphics and sound. Pupils were able to watch videos of the educational content while they are practicing learning.

- The early 1990s phase: The introduction of internet and World Web to the public formed the Internet-based training (IBT). IBT depended on providing a cheap and easy access to learning contents that overcomes time and location boundaries. However, the primary IBT lacked the interactive features of graphics and sound that CDs were providing as it depended on hypertext and pictures with limited access to audios and videos.
- The late 1990s to the early 2000s phase: In this phase, electronic- Learning (e-Learning) became popular. It combined the advanced features of CBT (i.e., graphics and sound) with IBT (i.e., hypertext) into a more sophisticated and user-friendly interface. Computer programmers were able to create Learning Management Systems (LMS) as online teaching and learning solutions. LMS served as virtual platforms through which teachers and pupils were able to access boundless sources of knowledge.
- The Late 2000 Phase: This the social software phase where the free and open content characterised this phase. Electronic forums such as blogs and wikis, for example, turned out to be a simple tool for publishing, sharing, and editing free educational and social content. Via these forums, teachers and learners were able to contact their counterparts around the globe. They were able to learn from each other through sharing their personal teaching and learning experiences and collaborating to find proper solutions for better education.

These five phases shows the development of ICT technologies and their significant role in the enhancement of teaching and learning (Bradley, 2021). Teachers were able to use

teaching machines to drill exercises that help pupils learning the basics of the language alphabet and basic mathematics through trial and error (Watters, 2021). Subsequently, technology developers integrated various features to these technologies to enhance the practices of teaching and learning. The addition of the audio/visual features to these technologies have enabled teachers employing different resources to attract pupils' attention and increase their interaction. These technologies have, also, enhanced the performance of teachers' teaching practices and enabled them to provide pupils with attractive learning activities that employ texts and audio-visual images/graphics.

## **2.2 Learning Theories**

Learning theories form the framework that enables educators to adopt efficient instructional practices that support the success of ICT integration (Brieger et al., 2020). Grounding ICT integration into learning theories provides an understanding of its efficiency and its potential advantages to the development of education (Clark, 2018). Behaviourism, Cognitivism, and Constructivism are the major learning theories that inform how learning happens and the role of ICT in this process (Pritchard, 2017). For the purpose of this study, I lent the lens of behaviourism and constructivism to explore their perspectives of teaching and learning and how they support the present study's purpose and goals. Revisiting these theories provides an understanding of the role of ICT in developing education and explains the factors that motivate teachers to use ICT in their teaching practices. Furthermore, it defines the implications of these theories on ICT integration in education (Illeris, 2018).

### **2.2.1 Behaviourism**

The work of Ivan Pavlov in the 19<sup>th</sup> century have inspired scholars to coin Behaviourism as one of the learning theories. According to Picciano (2017) Pavlov ran his experiments on dogs to observe their behaviour when he rings a bell to call them for food. He contended that Pavlov based his theory on the aspects of stimulus and response. He said that

Pavlov's first intent was to study animals' behaviour and the amount of saliva they can produce for better digestion. Upon these observations, Pavlov have defined three elements: the bell as the neutral stimulus, the food as unconditioned stimulus and the saliva, which dogs produce when hearing the bell, as the conditioned stimulus or response. His experiments with dogs formed the basis of a new psychological theory that studies species' observable behaviour. Pavlov's experiments have contributed to the adoption of behaviourism in education as a learning theory (Al-Shammari et al., 2019). Behaviourists such as Thorndike, Watson and Skinner played a significant role in developing this theory (Ahmad et al., 2020). They viewed learning as a mechanical process that requires a stimulus for a learner to produce a desired response. They contended that human behaviour can be expected through stimulus upon which humans develop their response (Illeris, 2018).

Bates (2019) said that Thorndike introduced his Law of Effect upon the observation of animals' behaviour to decide the time required for those animals to solve a simple puzzle. He contended that Thorndike considered the regular reinforcement of an exact behaviour produces the desired response. Thorndike, therefore, used a button / lever to run his experiment on animals. The button/ lever resembled a stimulus that an animal presses/pulls to obtain food which Thorndike regards as a response to this mechanical process. He further concluded that the regular practice of pressing the button or pulling the lever have enabled animals to decide the required response and solve the puzzles faster.

Watson used infants to examine the stimuli- response formula by observing their responses to the stimuli through various stages of their infancy. He exposed the enfants to a number of animals and voices to observe the behaviour they produce. Contrary to other behaviourists, Watson believed that learning happens from the interaction between humans and the surrounding environment. He was the "founding father" of the behaviourist movement (Bates, 2019, p.30). Watson argued that the frequency of information provided to

pupils helps them producing a modified behaviour to understand the new knowledge. Moore (2017) posited that Watson recognised “Pavlov’s method” as a useful “technique” that can be used to measure individuals’ “sensory capacities” but cannot be employed as a “framework” to study the behaviour of those individuals (p.10). Therefore,

In 1938, Skinner provided his theory of Operant Conditioning. The theory considered the notion of rewards and punishment could positively affect individuals’ learning outcomes (Clark, 2018). For him, teachers are able to provide learners with successful learning through conditioned instructions (Illeris, 2018). Skinner believed that rewarding and punishment help learners improve their level of learning. Pritchard (2017) regarded the strength of operant conditioning is in its flexibility than the other types of learning provided by earlier behaviourists. He said that Skinner believed that positive rewarding is the key aspect that enables learners to produce the desired learning response. He further contended that teachers can also use punishment as a “negative way” to adjust learners’ undesirable behaviour” to avoid negative effects on their learning outcomes (p.10).

Though behaviourism is considered as one of the prominent learning theories, it has its own pitfalls as well (Curry & Docherty, 2017). Behaviourism tries to explain species’ observable behaviours. In education, the established pedagogy of the theory depends on receiving learning rather than constructing it (Brieger et al., 2020). Behaviourists perceive learning as a mechanical process that associates stimulus to a response (S-R) (Skovsmose, 2023). They postulate that learning happens through teacher- modelling instructions that depend on repetition that enables learners to expected responses. Teachers are the active agent in the behaviourist learning approach. They who transfer the knowledge to learners through controlled instructional activities then reward learners when they produce the correct answers. Repetition for behaviourists strengthens learning and turns it into a habit, and enhances its efficiency (Kay & Kibble, 2016). Behaviourists regard learners as empty vessels



(tabula rasa) with passive role in acquainting knowledge (Clark, 2018). Learners in this theory receive rewards when they produce the correct answers and are disciplined if their answers were wrong. Behaviourists consider learning as a type of transmissive instruction of pre-arranged knowledge and learners have a limited role in acquiring this knowledge. Learners in this theory are similar to a sponge that absorbs the facts and ideas which teachers provide to them (Illeris, 2018).

Nonetheless, behaviourism lends credits to modern ICT technologies. The early models of the audio-visual tools and Computer-Assisted Instruction (CAI) were developed upon the behavioural concept of learning (Ansari et al., 2018). Pressy (1926) invented his teaching machine: the Programme Instruction (PI). The machine was designed to provide learners with a number of questions with multiple-choice answers. Learners, then, are required to select the correct answers to receive verbal appreciation, a gift, or points to improve their score in each subject (Sanusi et al., 2022). In the 1950s, Skinner introduced further developments to the PI machine. The new PI machine was built on the trial-and-error concept that was consisted of structural learning material with logical sequence. It was a fill in the blank programme that allows learners to fill in the correct answer before they are able to move to the next question (Clark, 2018). If learners fill in the wrong answers, teacher offers them a second opportunity to study the correct answers then try again. Skinner posited that the learning machine does not replace teachers' role in delivering teaching, but he considered it as an aiding tool that enables them to provide learners the subject content in small chunks to suit learners' individual learning needs (Watters, 2021).

### **2.2.2 Constructivism**

Constructivism views learning as a dynamic process that enables learners to construct knowledge and ideas rather than passively receiving them. There are three types of

constructivism: social constructivism , cognitive constructivism, and radical constructivism (Taber, 2019). Jean Piaget, Lev Vygotsky, and John Dewey are the pioneers of the constructivism theory. Though the views of those pioneers differ about how humans construct knowledge, but they all share a common ground that pupils are in control of their learning while teachers are the facilitators of learning (Rob & Rob, 2018). Proponents of constructivism view

learners as active actors who do not receive learning but construct it (Kaufman, 2018). They contend that individuals are able to construct various meanings of knowledge through their personal interpretations and experiences (Guo, 2018). For them, learners' minds are not empty, rather they have prior learning experiences they have formed from the interaction with the surrounding environment (i.e., society). In pursuing knowledge, learners interact with their surrounding environment and their peers then recall their prior experiences to build on them and construct their interpretations of the new knowledge (Kaufman, 2018). This is to say that learners are able to construct novice ideas and meanings of the knowledge they learn and relate them to their existing knowledge. Constructivists do not predetermine a single correct meaning of knowledge as behaviourists suggest. Rather, they constantly change it and reconstruct further relevant knowledge (Ahmad et al., 2020).

Piaget' theory of knowledge and intelligence formed a fundamental basis of radical constructivism (Mohammed & Kinyó, 2020). McLeod (2018) posited that Piaget was concerned about children's cognitive development and focused on the logical and mathematical reasoning and its role in the development of children' cognitive skills. He contended that Piaget perceived children's cognitive abilities are essential in the formation of their learning rather than receiving it. He said that Piaget perceived children as being "born with a very basic mental structure" that is inherent in their genes and develops overtime (p.2). He further contended that Piaget positions children in the centre of knowledge formation as

they have the ability to improve their thinking similar to adults. Aljohani (2017) also said that Piaget's constructivism focuses on two aspects: human mind and cognitive development. She posited that Piaget recognises learner as "an active creator" who is able to use her/his intelligence to shape and organise her/his learning experiences and transform these experiences into structured and meaningful ideas (p.98). She contended that Piaget recognises peer interaction as a type of social interaction through which learners are able to share knowledge and develop their cognitive abilities. This means that learners in Piaget's constructivism develop their cognitive skills through the interaction with their surrounding environment and the exposure to facts (Holstein & Miller, 2017). Through interaction, learners first assimilate the new ideas then accommodate them into their minds to develop their learning. This is to say that they combine their earlier experiences with what they observe in the classroom then use their minds to form a logical representation of these facts. Though Piaget argued that social interaction affects learners' learning experiences, however, he limited this social interaction within the school that represents the educational setting (Bjorklund, 2018).

Contrasting to Piaget, Vygotsky focused on the sociocultural and historical aspects that could positively and/or negatively affect learning. He contended that societies have diverse cultural norms and unique interpretations of knowledge and reality. He also posited that humans are able to construct knowledge through social interaction with members of their society in addition to the collaboration with their instructors and peers in the classroom. According to Pathan et al. (2018) Vygotsky viewed school as the primary source that provides learners with the objects, tools, and symbols that enable them to form their interpretation of the facts. Vygotsky theorised these thoughts under the concept of "Zone of Proximal Development (ZDP)". Vygotsky defined ZDP as the gap between the existing learning abilities of the learners and their potential development (Eun, 2019). He described

the ZDP as a gradual process that enables learners to accumulate their learning over time. This process enables learners to share their thoughts and relate them to their earlier experiences then interpret these thoughts into new meaningful forms of knowledge. ZDP also enables learners to improve their critical thinking skills and form novice ideas and knowledge into logical sequence (Brieger et al., 2020; Bodrova & Leong, 2018). In other words, learners in ZDP possess learning skills but they need guidance from instructors or members of society in addition to their collaboration with their peers to enhance these skills (Mohammed & Kinyó, 2020).

The third prominent scholar of constructivism is John Dewey. His learning theory blends the cognitive development of Piaget and the sociocultural aspect of Vygotsky's learning theory into the Concept of Inquiry. This theory is a pragmatic concept of learning that depends on engaging learners in social activities within school and society to form their knowledge. According to Beard (2018) Dewey did not perceive learning as a mechanical process that can be measured through regulated exams, but a flexible process that enables learners to form concepts and meanings and produce new forms of knowledge. He further contended that Dewey trusts learners' ability in shaping new forms of world realities continuously and believes that learners are able to construct their learning through their need to understand facts. This is to say that learners define a problem then discuss the related hypotheses with their peers and teachers to find adequate solutions to it (Suhendi, 2018). Through collaboration with their peers and teachers, learners are able to share ideas and benefit from each other's learning experiences (Visser, 2019). Dewey perceived this process as a real- life learning context that enables learners to reflect their thoughts and adapt their learning habits to new constructs that develop their critical thinking skills (Thorburn, 2018).

These views explain constructivists' tendency to refute behaviourists' view of learning as mechanical process (Eun, 2019). Rather, they view learning as a social and collaborative effort through which learners tend to actively construct knowledge rather than passively receive it. Lombardi and Shipley (2021) regarded the significant role of learners in constructing their "active learning" (p.9). They posited that learners should actively participate in their education and the production of knowledge. Constructivists recognise the role of ICT in helping teachers and learners to collect, process, and share related learning sources (Mohammed & Kinyó, 2020). They consider the role of these sources in developing teaching practices and increasing learners' engagement and social interaction that improve their critical thinking and problem-solving skills. Mattar (2018) contended that constructivism recognises teachers as facilitators whose main goal is to support learners constructing their learning rather than passively receive it. He argued that integrating ICT into teaching and learning can help learners to conduct simulation experiments that are hard to carry in physical laboratories, investigate the achievements of old civilisations', and solve complex mathematical problems as well. Constructivists consider the potential effect of ICT integration on the development of teaching and learning. They argue that ICT technologies can help teachers to organise learners into groups to discuss and negotiate different solutions to a specific situation/problem and find out the proper solutions. This in return increases learners' level of active participation in their learning while engaged in interactive activities. (Martin & Bolliger, 2018)

Constructivists also regard the potential of ICT's interactive audio/visual features in supporting constructivist teachers to improve their teaching practices and enhances their learners' abilities to reconstruct their learning (Bjorklund, 2018). They perceive that constructivist teachers are always able to employ ICT in classroom activities to create virtual learning environments that involve learners into authentic learning situations (Brieger et al.,

2020). These learning activities increase the level of interaction between learners and their teachers and help them examining abstract facts, share ideas with their peers, discover new concepts, and relate them to their earlier experience to reconstruct new forms of the existing reality. Chaudhary and Nagar (2018) posited that constructivist learning is made possible by modern ICT-based learning approaches which offer and facilitate rich resources of knowledge and encourage pupil-centred learning. They contended that these approaches connect learning to real contexts and enable pupils to practice these contexts. Furthermore, connecting ICT tools to the internet enables learners to access unlimited sources of information that increases their knowledge, partially or wholly, of the subjects they study (Holland & Lave, 2019). It also supports them to form novice ideas to make their learning solid and could even produce new concepts of common thoughts (Beard, 2018; Visser, 2019).

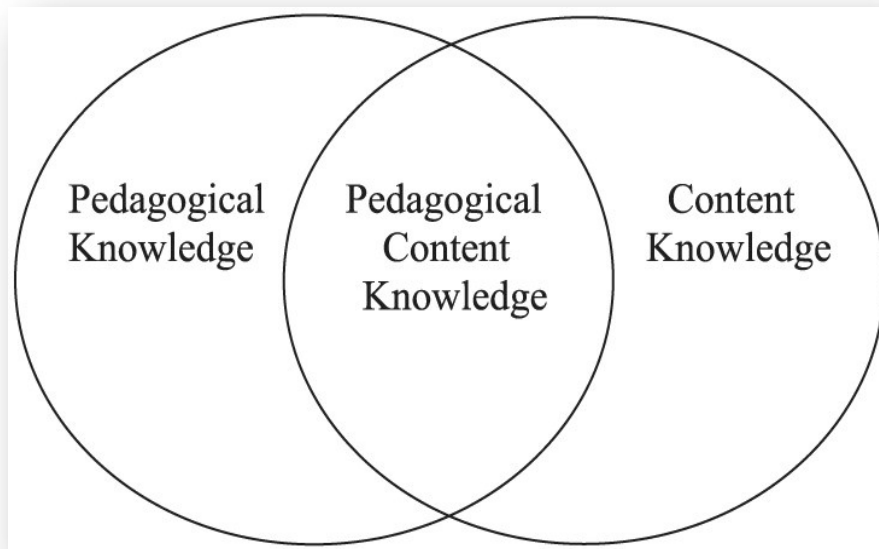
## **2.3 ICT integration Frameworks and Models**

This section discusses the role of ICT integration frameworks and models in defining the factors that affect the integration of ICT in teaching and learning. The first part discusses the Technological, Pedagogical, Content Knowledge (TPACK) framework and the type of knowledge that framework provides to enhance teachers' teaching skills. The second part explores two important models that define users' motivations to accept or reject the use of technology in their practices. These models are Technology Acceptance Module (TAM) and Unified Technology Acceptance Theory (UTAT).

### **2.3.1 TPACK Framework**

Scholars tried to define how learning happens and what type of knowledge teachers should acquire before they start their teaching career. Efforts of scholars have resulted in the introduction of different frameworks that aim to define the type of knowledge required for teachers to understand how to deliver the content of the subject efficiently. One of these

frameworks is Shulman's Pedagogical Content Knowledge (PCK). In 1986, Shulman introduced the PCK framework as an attempt to define the type of knowledge teachers need to acquire to deliver the subject matter content in an attractive fashion. Shulman noticed that literature have provided several studies that discussed how teachers' should manage the classroom, conduct classroom learning activities, and lesson planning. However, these studies ignored an important aspect that investigate how teachers form their pedagogical content knowledge. Therefore, Shulman presented his Pedagogical content Knowledge (PCK) framework. According to Shulman (1986), it is essential for teachers to learn about pedagogy content knowledge (PCK) to excel in their teaching. He defined knowledge of content as "the amount and organisation of knowledge per se in the mind of the teacher" while pedagogical knowledge "goes beyond knowledge of subject matter per se to the dimension of subject matter knowledge for teaching" (p.9). In other words, Shulman (1986) regarded the PCK framework as a source of knowledge for novice and in-service teachers. The PCK provides teachers with the necessary knowledge about the subject matter content (CK) and the pedagogical knowledge (PK) of the teaching approaches and strategies they can employ in the classroom to transform the subject matter content to pupils. The below figure shows the interaction between these concepts (i.e., CK & PK) to produce the final shape of the PCK framework.



*Figure (1) Pedagogical Content Knowledge (PCK). Depicted from Shulman, (1986).*

Shulman argued that teachers should not only hold considerable amount of knowledge about the subject matter content, but they should also be able to know how to employ their pedagogical knowledge in their teaching practices to transform the subject matter content to pupils. For him, “teaching necessarily begins with a teacher's understanding of what is to be learned and how it is to be taught” (Shulman, 1987, p.7). Therefore, Shulman argued that teachers need to combine these two aspects to enhance their pedagogical practices. This is to say that PCK is concerned with what teachers know and how they should teach what they know. Shulman emphasised that teachers should focus on employing teaching strategies that address pupils’ individual learning needs and provide them with meaningful learning experiences. This issue, according to Shulman, increases pupils’ level of engagement and enables them to actively interact with their peers and teachers as well (Chan & Hume, 2019).

Subsequently, Mishra and Koehler (2006) introduced a modified model that builds on Shulman’s PCK. This model is the Technology, Pedagogy, Content Knowledge framework- the TPACK. Mishra and Koehler included the technology aspect to Shulman’ PCK framework as they perceived the significant role of technology and its effect on the



development of teaching and learning. Mishra and Koehler (2006) defined the TPACK as “a conceptual framework for educational technology” that is necessary for teachers to improve their pedagogical practices (p.1017). The elements of the framework are presented in the below figure:

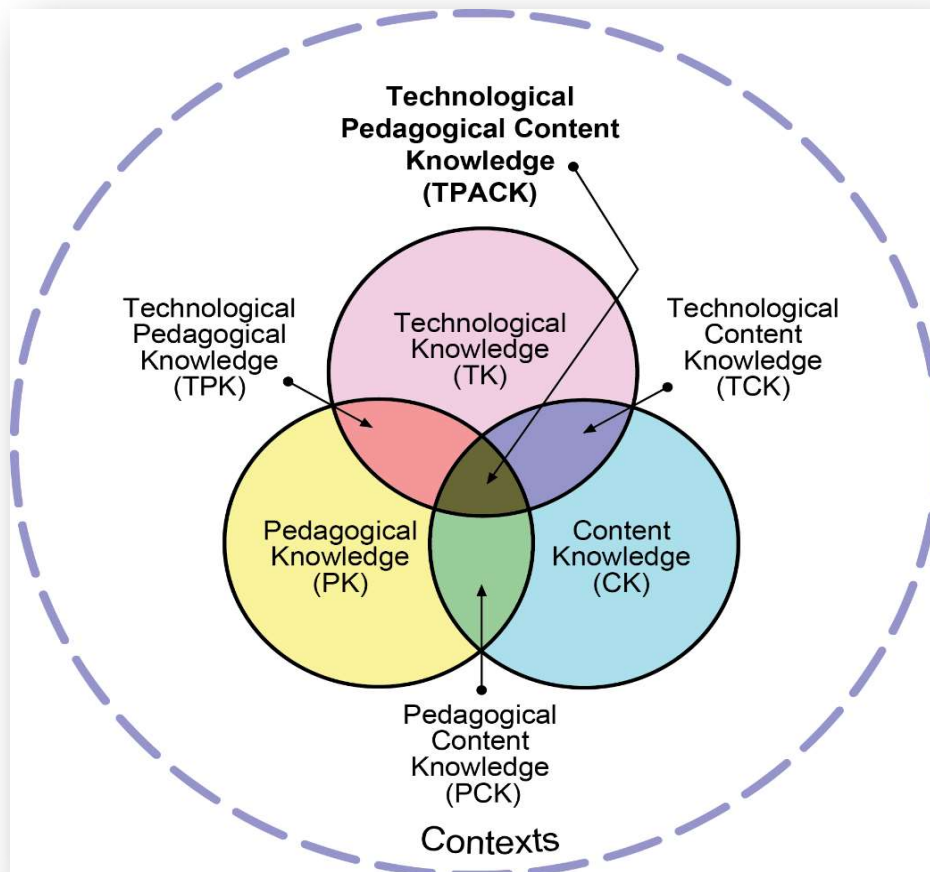


Figure 2: TPACK Framework: “Reproduced by permission of the publisher, © 2012 by *tpack.org*”.

Mishra and Koehler (2006) posited that the TPACK framework “attempts to capture some of the essential qualities of teacher knowledge required for technology integration in teaching” (ibid). The framework suggests that teachers are able to integrate ICT in their teaching practices successfully if they have sufficient knowledge of three elements: pedagogy knowledge (PK), content knowledge (CK), and technology knowledge (TK). The pedagogy knowledge (PK) refers to the learning theories that explains how learning happens and the

teaching approaches that teachers should adopt to help pupils understand the subject matter easily. Content Knowledge (CK) refers to the amount of knowledge that teachers accumulate about the subject matter content they teach. This implies that teachers need to study in-depth modules to gain significant knowledge from the various parts of the curriculum and the expected skills pupils will develop. The third element of the TPACK is the technology knowledge (TK). It is concerned with the development of teachers' technology skills that enable them to integrate educational technologies in their teaching practices. Mishra and Koehler (2006) argued that "teaching is a highly complex activity that draws on many types of knowledge" (ibid). This indicates that the previously mentioned types of knowledge do not work in isolation, rather they intersect and produce further types of knowledge that are important for the effective integration of ICT. These types are Pedagogical Content Knowledge (PCK), Technological Content Knowledge (TCK), and Technological Pedagogical Knowledge (TPK).

Pedagogical content knowledge (PCK) refers to teachers' understanding of the subject matter content and their ability to use suitable teaching approaches to fulfil learners' individual learning needs (Mu et al., 2018). Technological content knowledge (TCK) refers to the infusion of technology into the different parts of the curriculum. TCK enables teachers to employ the suitable ICT tools to conduct interactive learning activities that explain the different areas of the curriculum. These learning activities should increase pupils' level of engagement and enable them to interact effectively with their peers and teachers as well (Evens et al., 2018). Technological pedagogical knowledge (TPK) enables teachers to employ different pedagogical strategies that facilitate the use of various ICT tools into each learning task (Kind & Chan, 2019). Pedagogical strategies enable teachers to define the proper teaching approaches and employ the suitable ICT technologies that can help them perform their teaching practices. TPK also enables teachers to realise the pedagogical potentials and

constraints of ICT tools and how they can fit into their teaching and learning activities (Guillén-Gámez et al., 2021). This implies that teachers should select the right technology tools they plan to employ into the different pedagogical approaches to ensure the effective delivery of the subject matter content (Huang & Lajoie, 2021).

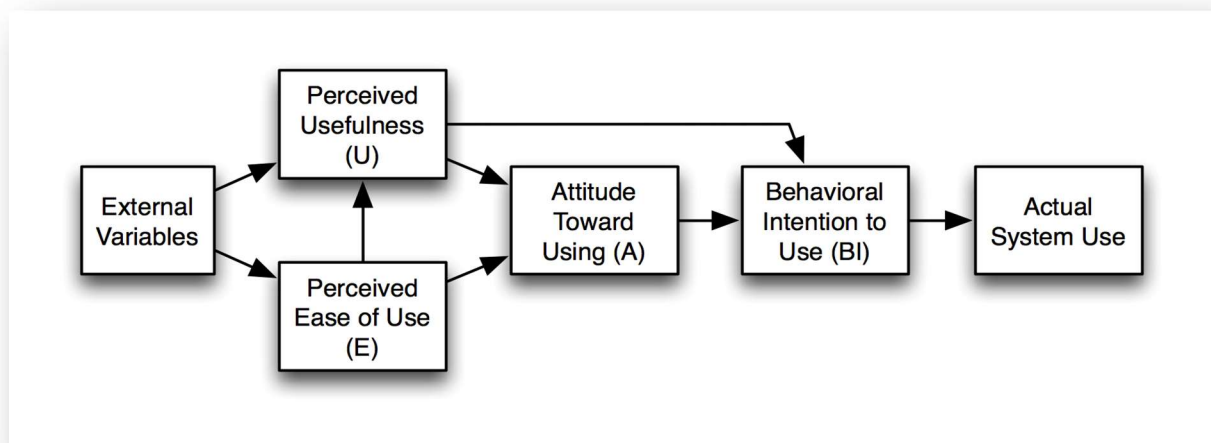
Literature provides numerous studies that have discussed the effectiveness of the TPACK framework in developing pre-service and in-service teachers' understanding of the previously mentioned types of knowledges. Altun (2019), for example, investigated the relationship between the attitudes of Turkish pre-service early childhood teachers towards technology and their TPACK “competencies” (p.249). She found that the types of knowledge in the TPACK formed the foundation for pre-service teachers' ICT integration in their future teaching practices. On the other hand, Chen and Jang (2019) studied the significant effect of the relation between “self-regulation” and the TPACK knowledge in the development of the in-service secondary school teachers' “professional development” in Taiwan (p.978). Findings of the study revealed that knowledge that in-service teachers acquired from the TPACK framework has positively affected their self-regulation and increased their knowledge about the know-how of teaching. They also said that the variation they found in participants' knowledge of ICT was due to the unequal adoption of technology in the country between urban and rural areas. Furthermore, Celik (2023) argued that the integration of AI into education requires the development of teachers' technological pedagogical knowledge. He surveyed the perspectives of primary, secondary and high school teachers in Turkey about the advantages that artificial intelligence (AI) can bring into education. The study findings revealed that teachers' knowledge of the TPACK triad enabled them to “deploy AI in education efficiently” (p.1). This is to say that the TPACK framework holds the essential knowledge required for teachers to deliver the subject matter content. The framework forms an interwoven relation between content, pedagogy, and technology. This combination

produces certain types of knowledge that enable teachers to enhance their teaching practices (Lachner et al., 2021). Teachers first start to accumulate the above types of knowledge during the initial teacher education programme (ITE). They, then, continue to gain more knowledge during the in-service training courses. TPACK can support novice teachers recognising the role that ICT can play in developing their teaching skills and how to employ best teaching approaches that can enhance pupils' learning outcomes (Chan & Hume, 2019). Furthermore, TPACK enables in-service teachers to decide on the best pedagogical approaches and the right technology tools they can employ to deliver meaningful and memorable learning experiences. TPACK, also, enables key actors in education to recognise the significant role of ICT in the development of the education system. This, in return, helps them putting reform plans that reflect the components of the TPACK framework in the current teacher education programmes and the in-service training courses as well (Elas et al., 2019).

### **2.3.2 The TAM Models 1 and 2**

Scholars have proposed different ICT integration models. These models can help stakeholders and users defining how ICT can be integrated in a specific context. The most commonly used models are, the Technology Acceptance Model (TAM1) 1 & 2 (Davis, 1989; Venkatesh & Davis, 2000), the Diffusion of Innovation model (DOI) (Rogers, 2003), and the Unified Theory of Acceptance Use of Technology (UTAUT) (Venkatesh et al., 2003). These models were designed to provide constructive and functional guide that explains users' various behaviours when adopting ICT and provide proper solutions for the existing or potential resistance to ICT integration (Scherer & Teo, 2019; Granić & Marangunić, 2019). They also help users to recognise their personal level of technology integration. Furthermore, these models investigate the factors that support users' decision to accept or reject using technology in their jobs.

In 1989, Davis developed the Technology Acceptance Model (TAM). He used both social psychologies, in general, and the Theory of Reasoned Action (TRA), in particular, as the ground base to construct this model (Davis,1989). TRA theory refers to the influence of individuals’ beliefs on their attitudes and how these beliefs motivate them to accept or reject ICT integration. According to Davis (1989) TAM investigates the factors that affect users’ acceptance or rejection of ICT integration. It is one of the models that has been extensively examined and, therefore, dominates the ICT integration research (Han & Sa, 2022). This explains the wide use of the model in defining users’ acceptance behaviour. The first version of the model was formed of two main constructs: perceived usefulness (PU) and perceived ease of use (PEoU) as shown in the below figure:



*Figure (3) TAM (1) model (Davis et al., 1989, p.985).*

According to Davis (1989), these two constructs “are theorized to be fundamental determinants of system use” as they form the users’ beliefs about technology and predetermine their acceptance or rejection of technology integration (p.319). Criticism of this early version of the TAM model was based on its limitation to the above constructs and negligence of other predictive factors such as social effects and individuals’ distinctive characteristics. Venkatesh and Davis (2000) extended the previous TAM model to the next

version TAM2 to overcome the aforementioned limitations. They included the social influence process (SIP) and cognitive influence process (CIP) constructs to “understand how the effects of these determinants change with users’ accumulating experience of the target system” (p.187). These constructs are presented in the below figure:

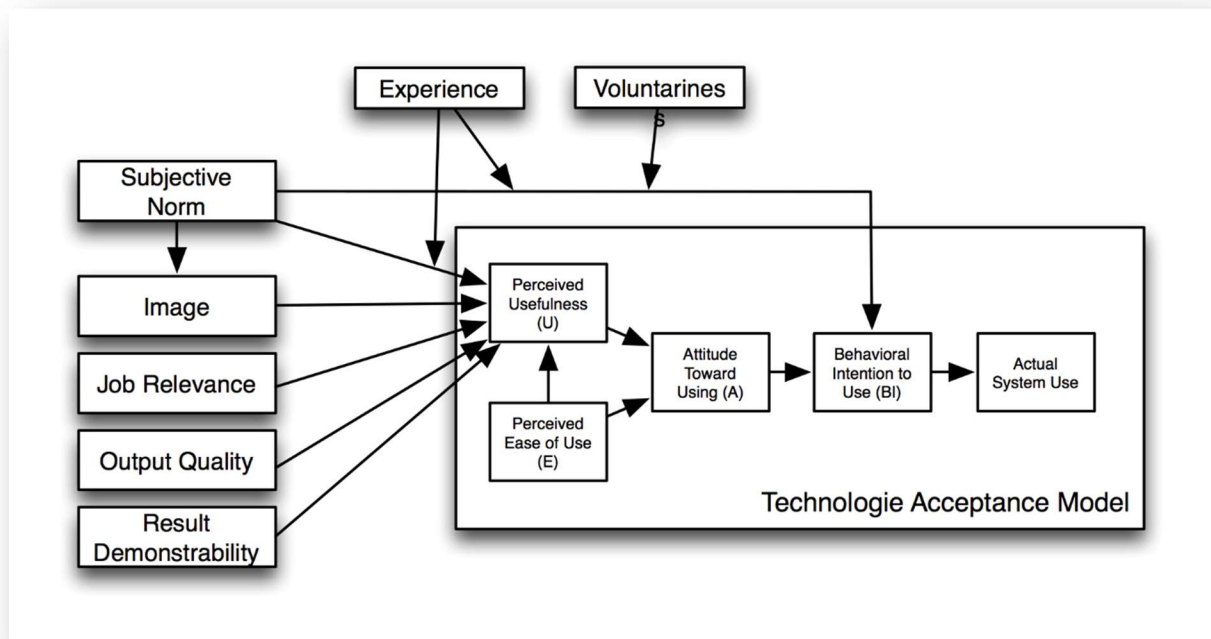


Figure (4) TAM (2) model (Venkatesh and Davis ,2000, p.188)

The social influence process (SIP) reflects three social forces: subjective norm, voluntariness, and image. Venkatesh and Davis (2000) posited that these variables are “interrelated social forces impinging on an individual facing the opportunity to adopt or reject a new system” (ibid). The Subjective norm (SN) describes how users perceive the surrounding society’s opinion of their acceptance of technology to enhance their social status. This indicates that SN has a direct effect on users’ intention to use technology if they realise that management considers it significant for their job performance. Users may not use the system at the preliminary stages, voluntarily, but the desire to enhance their social status within the group enforces them to use it.

Venkatesh and Davis (2000) posited that the benefits that users perceive while using the system are not the only motives behind their acceptance of the system. Rather, it is their intention to improve their performance at work. They argued that users' desire in improving their performance leads to the development of their social status and increases their "power and influence" and confirms their identification and increases their productivity as well (ibid). Venkatesh and Davis (2000) contended that users exhibit this behaviour before the organisation implements the technology system and said that this behaviour remains effective until they gain sufficient experience in using that system. They explained this notion as:

*".... the direct effect of subjective norm on intentions for mandatory usage contexts will be strong prior to implementation and during early usage but will weaken over time as increasing direct experience with a system provides a growing basis for intentions toward ongoing use" (ibid).*

On the other hand, the cognitive influence process (CIP) reflects four instrumental factors: job relevance, output quality, result demonstrability, and perceived ease of use. These are the direct variables that affect users' intention to use technology. Venkatesh and Davis (2000) derived the CIP determinants from three theories: "work motivation, action theory, and behavioural decision theory" (ibid). The three theories perceive the development of users' behaviour towards using technology as a type of "mental representation that links higher-level goals to specific actions" that aim to achieve the required job tasks (ibid).

Venkatesh and Davis (2000) said that users consider their use of technology relevant to their job if they perceive the system appropriate and supports them in achieving the job tasks. It is, for them, a type of "cognitive judgment" that enables users to evaluate the usefulness of the system and its ability to support their efforts in performing the required tasks (ibid). They further contended that the accomplishment of tasks leads users to think about the condition of the tasks they perform on the system. They described this as the output

quality that enables users to recognise “how well the system performs those tasks” and measures the quality of the system’s productivity as well (ibid). Venkatesh and Davis (2000) related the output quality to users’ perception of the system’s usefulness. They posited that as long as the system enables users to perform their job tasks and complete these tasks in a competent fashion, users will increase their level of trust in the system and will try to develop their skills to continue using the system. Venkatesh and Davis (2000) argued that users would continue monitoring the results of the system to determine if they are practical and “discernible” (ibid). They further contended that “result demonstrability” enables users to trust the system as long they are able to communicate the outcomes with other colleagues at work or within the community (ibid). Venkatesh and Davis (2000) also described the system’s perceived ease of use as the fourth instrumental factor of the CIP. This factor refers to users’ perceptions of the ease of use of a particular system. They considered this factor as “a direct determinant” of the system’s usefulness that enables users to spend less efforts to recognise its relevance to their job and how it can help them developing perceptible quality results which they can share with other members within at work (ibid).

Literature provides a plethora of studies about the significant role of the TAM model in integrating ICT. Rafique et al. (2020), for example, investigated researchers’ use of mobile library applications (MLA) as digital libraries to define the factors that influence researchers’ acceptance of MLA and the extent of using them. They found that the perceived ease of use of these applications was one of the direct predictors for researchers to use MLA while the system quality and regular use of MLA influenced researchers’ intention to use these applications. Another interesting study was conducted by Han and Sa, (2022) to examine university pupils’ acceptance of online learning during the COVID pandemic’s restrictions. They found that the use of the TAM model constructs of perceived ease of use and usefulness of online classes have positively affected pupils’ satisfaction with the educational content of



these online classes. Furthermore, Schneider et al. (2023) conducted a study about user's experience and acceptance of vehicle automated systems. The study aimed to measure users' satisfaction with these systems and the expected negative results of faults. The study findings revealed that "the perceived feeling of control and safety" formed an essential element for participants while using the system (p. 548).

To summarise, the prominence of TAM arises from its adaptability in various fields including education. The model provides practical, simple, and easy to understand explanation to the variables that affect users' intentions to integrate ICT. The model can be employed to measure pre-service teachers' intentions to use technology in their future profession and the current in-service teachers' actual utilisation of ICT in their teaching practices. This is to say that part of human interaction with technology is to trust it and feel that they are in control of it. This in return develops a feeling of safety that encourages them to accept using it in the different walks of life including education.

### **2.3.3 Unified Theory of Acceptance and Use of Technology (UTAUT).**

The unified theory of Acceptance and Use of Technology (UTAUT) is the second model that discusses the issue of technology integration and acceptance. The massive investments in technology and the desire to expand its usage in all fields has led to the existence of this model. Venkatesh et al. (2003) reviewed the existing literature of eight technology models that measures users' acceptance of technology at work. They reviewed 1) the theory of reasoned action, 2) the technology acceptance model, 3) the motivational model, 4) the theory of planned behaviour, 5) a model combining the technology acceptance model and the theory of planned behaviour, 6) the model of PC utilization, 7) the innovation diffusion theory, 8) and the social cognitive theory" (p.425). Venkatesh et al. (2003), then, developed the UTAUT model to "formulate a unified model that integrates elements across

the eight models” (ibid). The below diagram presents the constructs of the UTAUT model and their related variables.

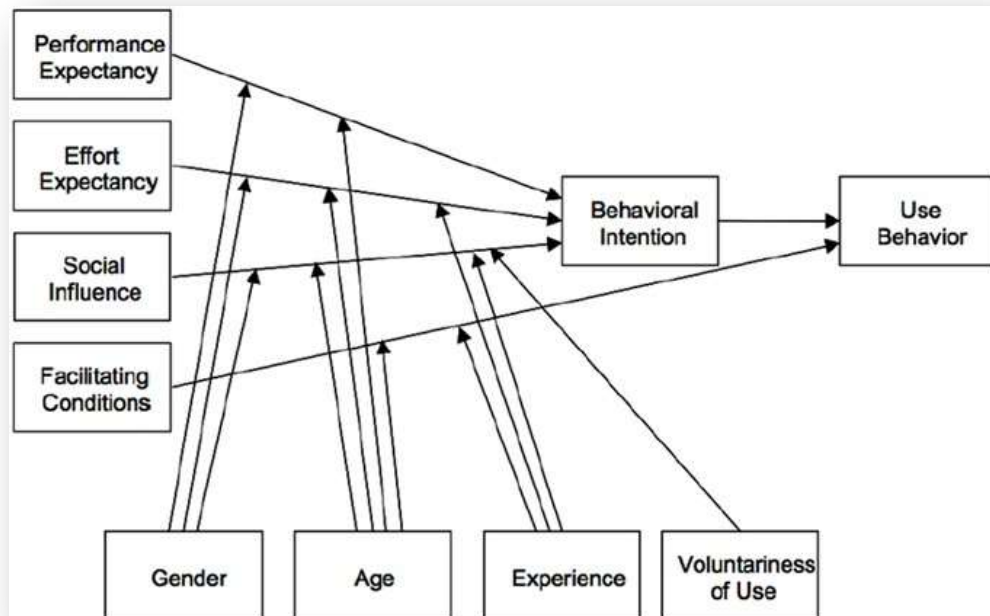


Figure (5), *Unified Theory of Acceptance and Use of Technology Venkatesh et al. (2003, p.447)*

Venkatesh et al. (2003) explored the above-mentioned models that explain how individuals perceive the effect of utilising technology on their social image in the surrounding society. They then structured the UTAUT model that is consisted of four constructs: “performance expectancy, effort expectancy, social influence and facilitating conditions” (ibid). Venkatesh et al. (2003) contended that these constructs are the direct determinants of individuals’ behaviour towards innovation and their intentions to integrate these innovations at work. They posited that users’ acceptance and intention to use technology depend on how they perceive the ease of employing it at work, how it can develop their job performance, and whether it can enhance their social status in the surrounding environment. They said that users’ intention to use technology can be strongly predicted through the performance expectancy construct. They found that performance expectancy “appears to be a determinant

of intention in most situations” (ibid). This construct discusses how technology can help users performing their job tasks and enhancing their work performance. Effort expectancy is the second construct of the UTAUT model. It refers to users’ trust and utilisation of technology at work as long as it enables them to complete their job tasks in less time and in the right manner. Users in this construct accept technology and use it as long it is easy for them to use it with less efforts. Furthermore, the continuous exposure to technology enables users to improve their experience with technology and increases their intention to use it continuously.

Venkatesh et al. (2003) perceived the social influence construct as “significant” and can have a direct effect on non-expert users’ intention to use technology as a compliance to the place of work’s culture which they define as the “mandatory setting” (ibid). This construct is about the surrounding social environment and its effect on users’ intention to use technology particularly if they recognise that it will positively affect their social status. This may come in the form of a praise of their technology skills or as mandatory skill that forms a part of the job requirements. The last construct discusses the facilitating conditions related to technology integration. The facilitating conditions are related to the available type of technology infrastructure, the technical and organisational support at the place of work. Venkatesh et al. (2003) said that this construct can directly affect users’ usage of technology but does not affect their intention or behaviour to use technology as long as “both performance expectancy constructs and effort expectancy constructs are present” (ibid). They argued that this construct is essential for users to continuously run and use technology. It is concerned with abolishing any existing barriers that obstruct the use of technology and providing users with technical support to manage issues that arise while they use technology.

There are several studies that discussed the influence of the UTAUT constructs (i.e., performance expectancy, effort expectancy, social influence and facilitating conditions) on users’ intention to adopt ICT (see for example: Nikolopoulou et al., 2021; Bower et al., 2020;

Jain & Jain, 2021; Garone et al., 2019; Mojarro Aliaño et al., 2019). The study of Bower et al. (2020) was about the extent to which pre-service teachers perceive the use of Immersive Virtual Reality (IVR) in education. They found that all the constructs of UTAUT influenced pre-service teachers' intention to use IVR as an effective tool that can develop their learning experiences. They found that participants recognised the role of IVR in enhancing pupils' engagement and increasing their motivation. Another study was conducted by Nikolopoulou et al. (2021) to investigate the factors that influence primary and secondary school teachers' intention to use mobile phones in their teaching practices. They found that constructs such as performance expectancy, motivation, and regular use of technology were the motivating factors that impacted teachers' intention and actual use of mobile devices in education. Furthermore, Jain and Jain, (2021) studied the acceptance and use of videoconferencing by university lecturers as one of the learning management systems (LMS). They found that UTAUT's four constructs predicted lecturers' behavioural intention to use these LMS in their teaching practices.

## **2.4 The role of ICT in the development of education**

The "ICT acronym" stands for Information and Communication Technology (Ishaq et al., 2020, p.1117). It defines the type of technology tools teachers and pupils can use at school and /or home to develop the teaching and learning process. UNESCO (2009) provided the following broad definition of ICT:

*"a diverse set of technological tools and resources used to transmit, store, create, share or exchange information. These technological tools and resources include computers, the Internet (websites, blogs and emails), live broadcasting technologies (radio, television and webcasting), recorded broadcasting technologies (podcasting, audio and video players, and storage devices) and telephony (fixed or mobile, satellite, videoconferencing, etc)" (p. 120).*

This definition describes the various types of ICT tools and their unique features and functions. It also defines the tasks that these tools can perform when individuals use them in all occupations. Literature provides a wealth of studies about the significant role that ICT can play in the development of education (See for example: Love et al., 2016; Nikou & Economides, 2021; Hammond, 2014; Fernández-Gutiérrez et al., 2020; Ishaq et al., 2020; Al-Rahmi et al., 2020; Haleem et al., 2022; Das, 2019). These studies investigate the effect of ICT integration on teaching and learning. They also define how teachers are able to employ these tools in their pedagogical practices and how pupils are able to use several ICT tools to accumulate knowledge in the classroom and beyond school as well. As the present study is concerned with the role of ICT in developing teaching and learning practices, it is significant to understand how teachers the advantages of ICT in enhancing their teaching practices and how pupils perceive the role of ICT in developing their learning experiences.

#### **2.4.1 Teachers' use of ICT**

Several scholars have conducted studies that investigate teachers' use of ICT in the classroom and its effect on their teaching practices and the development of pupils' academic performance. Scholars posited that teachers tend to employ interactive teaching approaches that integrate ICT into the learning activities to deliver meaningful learning experiences. These approaches focus on engaging pupils as active agents in acquiring learning rather than receiving it. Ahmadi (2018), for example, conducted a literature review about the use of technology in learning English as a foreign language. He contended that teachers' use of ICT aimed mainly to provide their pupils with better learning experiences to develop their critical thinking, increase their level of interaction, and improve their academic results. He concluded that teachers used ICT tools to facilitate learning activities to help pupils accessing information pertinent to their learning. This type of information has enabled pupils to conduct research projects, download further supplements to understand the different parts the lesson,

and share ideas about homework with their peers. Love et al. (2016) argued that “technological advances in ICT have allowed for “resource-rich environment” that encourages teachers to adopt effective teaching approaches to enhance pupils’ academic performance (p.314). They also concluded that these advances encouraged teachers to infuse ICT “across the curriculum” to facilitate collaborative learning that motivates pupils to work in groups and share ideas with their peers about the difficult parts of the lesson or homework and brainstorm to them” (ibid). Nikou (2023) studied the effect of employing ICT in the classroom to engage pupils in interactive learning activities. He found that ICT enhanced pupils’ learning skills and increased their creativity and productivity in their future employment. He also found that these activities enriched their critical thinking skills and bridged the gap between pupils’ individual levels of learning.

Other scholars concluded that teachers’ use of different forms of ICT technologies have supported the academic performance of their pupils. Szymkowiak et al. (2021), for example, investigated the effect of technology on knowledge acquisition. They contended that internet connectivity allowed teachers to use ICT to explore the world web and select supplementary materials that are relevant to the subject/s they teach. Teachers streamed live broadcast or stored the content then retrieve it in a late stage to conduct classroom activities that aimed to increase pupils’ interaction and improve their engagement in learning. They further contended that ICT tools such as iPads/tablets, and smartphones enabled young learners to access unlimited online resources that supported them to accumulate knowledge and enhanced their learning experiences. Anastasiadis et al. (2018) investigated teachers’ use of “digital games” in education to engage pupils in collaborative learning activities and their effect on the development of their academic performance. They found that teachers’ use of digital games, as a form of education technology improved pupils’ critical thinking skills. Licorish et al. (2018), also, examined how teachers perceived the use of the Kahoot

application in the classroom activities and its effect on pupils' academic performance. They contended that teachers were able to employ Kahoot in different learning activities and pupils perceived Kahoot as an effective tool that “enriched the quality” of their learning outcomes (p.1).

Other studies investigated the effect of utilising ICT in different teaching and learning strategies and how these strategies have helped teachers expanding pupils' knowledge of the subject content. Firth et al. (2021), for, example, conducted a systematic literature review about “interleaving” as a concept of learning strategy. They discussed the use of the “interleaving strategy” to empower pupils’ memory by exposing them to different “visual examples” (p.668) that facilitate their “inductive learning” (ibid). This implies that ICT technologies can facilitate pupils’ learning of various subjects (Bogusevski et al., 2020). For example, in second or foreign language classes teachers who employ the audio/visual features of ICT tools in these classes are able to motivate their pupils’ cognitive skills. Streaming video clips that contain real- life situations or displaying a film or a play can improve pupils’ language skills of reading, writing, speaking, and listening. Watching these videos/films can also enable pupils accumulating new vocabularies, phrases, and expressions and learn proper pronunciation as they watching how native speakers pronounce them. This in return helps pupils developing their language skills, becoming aware of the cultural norms of other nations, and recognising how different or similar these norms to their own cultural norms (Halim & Hashim, 2019). Teaching science , physics and mathematics can be daunting and even boring if teachers are not able to deliver the content in attractive fashion. ICT integration can also support teachers in delivering the content of these subjects attractively. These subjects enable teachers to form pupils into groups and work together to find out the proper solutions. Teachers can conduct virtual experiments in science through which pupils can learn how chemicals agents interact and produces a specific or novice product. Physics

and mathematics are about transforming numbers into formulas to build structures in various fields such as computing, engineering, and medicine. Teachers can employ ICT to display math problems and equations in an attractive way to increase pupils' level of engagement. They can use mathematics applications and calculus tools to help their pupils understand this subject easily and even excel in it. This, in return, can enhance pupils' critical thinking while trying to solve problems and providing answers to these problems (Haleem et al., 2022).

Social studies, also, is one of the subjects that covers different topics. The focus of social studies is to understand how societies function and how individuals build their inter- relations within these societies and how they form their perspectives about the society (Bai et al., 2016). Though it differs from a country to country, however social studies usually cover topics about history, geography, economics, politics, sociology, criminology, and anthropology. Other topics such as climate change and global warming and their effects on earth, immigration, distinction of species, and economy are also part of social studies. This array of topics enables teachers to support pupils accumulating knowledge about old civilisations and the role of these civilizations in the development of human history (Das, 2019). Furthermore, ICT plays a key role in combating illiteracy (Selmi, 2023). Through the internet, teachers can conduct learning activities to offer illiterate individuals a second chance for learning. Ratheeswari (2018) found that embedding ICT into curriculum enabled teachers to structure their teaching practices in a way that suits pupils' individual levels of learning. He posited that utilising ICT into the curriculum offers pupils the chances to understand subjects much easier than traditional teaching practices which depend on teachers solely. He further argued that ICT can provide pupils with effective methods that can enhance their academic performance.



### **2.4.2 Pupils' use of ICT**

The positive effect of ICT integration on pupils' academic performance is documented in literature. Different studies showed that ICT resembles a type of learning medium that allows pupils to engage in challenging learning activities. ICT comes in the form of fun games that enable pupils learning new language/s or understand the complicated mathematic laws. It can help pupils developing their technology skills and offers them the opportunity to examine knowledge and form their own ideas of the world. It also enables pupils to overcome physical barriers that can hinder their learning. ICT also enables pupils to present their projects in a neat and tidy fashion. In the classroom where teachers use ICT, pupils have the opportunity to take part in learning activities that cover the different areas of the curriculum. This, in return, should enable them to sharpen their digital skills and enhance their learning outcomes (Reddy et al., 2020). Love et al. (2016), for example, said that ICT enables pupils to become active learners who can debate and discuss ideas and facts that can develop their critical thinking skills. They argued that pupils can improve their digital literacy through the continuous use of ICT in the classroom and after school as well. They contended that pupils prefer to have an active role in acquiring their learning rather than passively receiving it. Sakamoto (2018) also contended that ICT can improve pupils' "information literacy" (p. 287). He concluded that pupils' regular access to ICT enhances their capabilities to gather information and evaluate how relevant it is to their learning. He further contended that pupils' participation in these activities improve their digital literacy and enhances their learning outcomes. Ishaq et al. (2020) also found that providing pupils with access to ICT tools has improved their learning competencies. They said that access to ICT tools in the classroom have increased pupils' level of attainment, enhanced their academic productivity, and improved their computing skills. They further contended that pupils' level of engagement in their learning and interaction with their peers and teachers has increased overtime. Nikou

and Economides (2018) investigated the effect of “Mobile-based micro learning and Assessment (MBmLA)” on the development of pupils’ motivation to improve their performance in science education (p.269). They found that the MBmLA approach have enhanced pupils’ satisfaction in their learning outcomes. They further contended that MBmLA has improved pupils’ performance in doing homework and performing exams as well. They also found that this approach has increased pupils’ motivation to improve their learning results by taking part into technology- centred activities to share ideas with their peers and gain novice knowledge.

The reliable audio/visual features of ICT can provide pupils with high quality and presentable results which enable them to perform the learning activities in an easy and quick fashion. These features and capabilities of ICT enable pupilsto conduct virtual experiment on the smartboard and define the chemical characteristics of an agent and its reaction to other agents and the final product. Amer (2020) argued that the use of interactive boards have enhanced pupils’ learning performance. He implied that these ICT tools have enabled teachers to develop pupils’ critical thinking skills and increased their level of interaction. He posited that the distinctive features of ICT have changed the traditional learning routines into more interactive and exciting lessons. pupils’ participation in these activities have improved their digital literacy and enhanced their learning outcomes. These ICT-led activities have enabled pupils to run virtual chemical experiments by adding or removing substances safely and obtain instant results. Another important study was conducted by Nikou and Economides (2021) to identify the factors that affect pupils’ “satisfaction” and their “continuance intention” to use mobile technology in learning (P.2). The study findings revealed that factors such as perceived ease and satisfaction have positively affected pupils’ intention to continuously use mobile technology in their learning.

To conclude, the ubiquity and efficiency of ICT in storing, managing, broadcasting, and sharing information have made it able to provide efficient advances in education and expanding access to learning (Nikou & Economides, 2018). It can be considered as an ideal vehicle that can enable educators providing educational solutions to tackle the various educational problems. It can also help them shifting from traditional teaching approaches to dynamic and effective learning pedagogies can that increase pupils' interaction and enhance their academic outcomes. Pupils' regular use of ICT outside school should be a motivational factor for teachers to encourage them to learn more about the use of ICT in their learning.

## **2.5 Factors influencing ICT integration**

The previous section have shown that utilising ICT into teaching practices provides teachers with powerful tools to deliver the subject matter content smartly (Turner-Cmuchal & Aitken, 2016). It also facilitates collaborative learning for pupils and enables them to analyse facts, brainstorm ideas to solve problems, and form new knowledge. However, it is important to identify the factors that can affect the success or failure of ICT integration. Identifying these factors is essential for policy makers and educators whilst they propose reform plans of the education systems. Lawrence and Tar (2018) posited that it is significant to define the factors that can affect teachers' decisions to accept or reject the integration of ICT in their pedagogical practices. They argued that identifying these factors can help decision makers to develop a comprehensive understanding of the significance of ICT integration. Various studies have found that ICT infrastructure, technical support, professional development, leadership, policy, teachers' beliefs about technology, and teacher's pedagogical knowledge were the major barriers that affect teachers' intentions to integrate ICT. Phan and Dang's study (2017) conducted a study about the technology readiness of lecturers for online teaching at universities in Vietnam. They found that lecturers' beliefs and attitudes towards ICT integration, time constrains, and ICT skills were some of the major barriers that lecturers

have perceived. They argued that universities should investigate these barriers to help improving faculties' ICT skills. Mahdum et al. (2019) also investigated how secondary school teachers in an Indonesian rural school perceived the integration of ICT and what motivated them to use it. They found that ICT capabilities in addition to developing teachers' technology skills were among the key issues that hindered the full integration of ICT. Goh and Sigala (2020) investigated the barriers that affect the decision of university lecturers in hospitality sector in Australia to integrate ICT in their teaching practices and the possible ways to overcome these barriers. They found that technical support and teachers' beliefs have formed barriers to lecturers to integrate ICT in their teaching practices. They suggested that institutions should overcome these barriers to support permanent integration of ICT. Al-Awidi and Aldhafeeri (2017) explored teachers' technology readiness in Kuwait to shift from employing traditional approaches in their teaching practices and adopt constructive teaching approaches that facilitate ICT integration in their teaching practices. They found that teachers perceived ICT training, ICT infrastructure, and technical support were the barriers for them to integrate ICT. The aforementioned barriers will be discussed in detail in the coming section.

### **2.5.1 ICT Infrastructure**

ICT Infrastructure refers to the availability of technology resources at schools. These can be the operating programmes/applications, computers, laptops, iPad/tablets, smartboards, and internet connection (Kundu et al., 2020). These resources are the essential requirements for the success of ICT initiatives and projects in both developing and developed countries. Vermeulen et al. (2017) argued that "ICT- infrastructure" is one of the variables that affect teachers' decision to integrate ICT in their teaching practices (p.1427). They concluded that the presence of ICT infrastructure is one of the supporting motives for better learning outcomes. The lack of a proper infrastructure reduces the likelihood of the development of a country's educational reform plans and may affect its economic growth as well (Rana &

Rana, 2020). Introducing ICT initiatives and projects to reform education requires the provision of reliable internet connection, stable sources of power, smart/ interactive boards, desktop computers, and laptops/Chromebooks (Das, 2019). In addition, mobile technologies such as iPads and tablets are more advanced technologies that many countries are presently providing to their teachers and pupils to benefit from their potentials in developing teaching and learning (Salam et al., 2018). Bradley (2021) and Eyles (2018) conducted interesting studies about the significant role of ICT infrastructure. Bradley (2021) studied the role of infrastructure in supporting the learning management systems (LMS). He found that infrastructure supports online teaching and learning practices that provide pupils with “model discussions, plan online activities, set learning expectations” (p.68). These findings align with Eyles’ (2018) study that investigated music teachers’ perspectives about the integration of ICT in music education. The study findings revealed that the limited sources of ICT forced teachers to “limit their pedagogy to whole class” (p.110). The aforementioned studies linked the availability of ICT technology to the success of ICT integration into education. They further contended that good teaching practices are positively affected with the presence of a sustainable ICT infrastructure. Barrett et al. (2019), also, contended that school’ s infrastructure plays an important role in developing education. They posited that providing teachers and pupils with enough number of ICT technologies accelerates the integration process. Furthermore, Leem and Sung (2019) considered the role of mobile technologies such as iPads and tablets significant in the development of teaching and learning practices. They contend that these technologies are characterised as being handheld portable technologies that can be used out of time and place boundaries. This aligns with Nikou and Economides’ study (2021) about pupils’ continuous use of mobile learning. They argue that pupils at present use them for their formal learning at school and informal learning experiences after school. Teachers also use mobile devices either as part of an official initiative or as a portable tool

with more functions they can use to present the subject content. Fabian et al. (2018) studied the effect of using mobile devices in bridging “classroom learning to real-world” (p.1119). They found that the nature of these tools supports teachers’ efforts to improve their pupils’ academic performance. They argued that these tools motivate teachers to use pedagogical approaches that are compatible with these tools to augment their pupils’ formal and informal learning experiences. They further concluded that teachers use these tools to provide pupils with a one-to-one learning opportunity to help pupils understand the subject matter in their own pace. This, in return, can improve pupils’ critical thinking skills and their academic performance as well (Kaliisa et al., 2019). This institutes that desktop computers and smartboard are powerful learning tools that teachers use to conduct interactive learning activities to support pupils’ learning needs (Lawrence & Tar, 2018). They help pupils learning how to write documents, sort, and analyse data, and prepare presentations. Pupils can also use them to learn programming to create a simple webpage or a more complex learning game they can use to develop their academic performance (Guan et al., 2018).

It is also important to provide schools with stable internet connection to help teachers achieving the goals of learning (Stec et al., 2020). The availability of smart/ interactive boards also enables teachers to display learning materials that help pupils understanding the different areas of the subject-matter. Teachers use smartboards to visualize the subject content by streaming a series of pictures or videos that present facts and ideas interactively (Nikou & Economides, 2021). Through these activities pupils can present their own ideas of the topic, draw conclusions, and offer solutions. Furthermore, these activities enable teachers defining pupils’ individual levels of learning needs and identify their strengths and weaknesses. These activities enable teachers to increase the level of interaction between pupils and the inclusion of low-level pupils to benefit from the high level of their peers. This points to the fact that internet connection provides teachers with consistent source of

knowledge that enables them to plan different learning activities and enhance pupils' technological skills. Pareja Roblin, et al. (2018) found that internet access was one of the significant factors that influence teachers to integrate ICT in their teaching practices. They concluded that having internet connection in the classroom enabled teachers to explore the web for materials they can use to present the subject matter content in an attractive manner. Internet also enabled teachers to stream videos, display pictures and presentations, and downloading learning games and activities that attract pupils' attention and increases their level of interaction. Teachers were able to share these materials with pupils by email or save it on a shared folder that can accessed online or offline.

### **2.5.2 Technical Support**

Literature informs that technical support at schools forms a critical factor that can either have a positive or negative effect on ICT integration. Salam et al. (2018) argued that ICT integration is not only concerned with the provision of technology resources, rather it refers to providing teachers with effective technical support to avoid technical problems that would affect teachers' utilisation of ICT in their pedagogical practices. They contended that the provision of technical support enables teachers to save time and deliver the content of lessons efficiently. The aforementioned problems can form barriers to teachers utilising ICT if proper technical support is not available for them at schools. Teachers may hesitate to try fixing the problem if they do not have any technical background or they may fear that something wrong could happen to the machine. Thus, it is essential to have trained technical staff at schools is essential to grant the smooth operation of ICT tools and the success of the integration process (Das, 2019). Technical staff can be a dedicated team employed by school or well-trained teachers who have received recognised technical training courses. They address technical problems that teachers may encounter while utilising ICT tools in their pedagogical practices.

Providing technical support on regular basis decreases the risk of technical malfunctions and protects the tools from being out of service for lengthy periods. Wu et al. (2019) investigated the role of technical support in the success or failure of ICT integration at rural and urban schools of basic education in China. The findings of the study showed that the continuous technical support sustained schools' technology facilities and made ICT integration achievable. However, they found that the existence of unsolved technical issues can be frustrating to teachers and could form a barrier for them while delivering the subject content. They further contended that these unresolved technical issues could also affect teachers' decision to use digital resources in their teaching practices. This means that availability of technical support at schools provides teachers with a sense of secure and success once they are able to finish the teaching session without any technical breakdowns. It further reduces the level of anxiety teachers may feel when confronted with damaged machines and increases their level of trust in ICT technology. This, in return, encourages teachers to continue utilising ICT in their pedagogical practices and gain more confidence in their technology skills. These technical problems could be major hardware issues such as operating system malfunction, broken keyboard, mouse, and screen, or software issues such as application glitches, malware attacks, outdated systems, inability to open email, or downloading a programme. Gil-Flores et al. (2017) considered the lack of technical support as one of the primary barriers to ICT integration at secondary schools in Spain. They posited that technical support has, significantly, affected secondary school teachers' utilisation of technology in their teaching practices. They contended that teachers perceived the persistent breakdowns of ICT tools formed a challenge for them and affected their efforts to implement technology-based learning activities. Other scholars contended that education stakeholders should provide enough financial resources to secure the continuous and professional technical support to schools. Kundu et al. (2020), for example, studied the relationships between the



supervision of technical support and teachers' self-efficacy. They posited that technical support was one of the factors that affected teachers' self-efficacy in utilising ICT. Findings of the study revealed that the availability of technical support at school increased teachers' self-efficacy as they were confident that a skilled technician was available to manage the technical problems. The results of these studies align with two studies that were conducted in Egypt ( Badran et al., (2021) and Moustafa et al., (2022). Badran et al.'s study (2021) was about the perspectives of secondary school teachers in Egypt about ICT adoption. They found that though teachers hold positive perspectives of the advantages of ICT integration, they defined inadequate technical support as one of the persistent challenges they face. This to say that teachers' inability to address these technical problems may results in negative effects on teachers' image, decrease their self-confidence and they could feel embarrassed in front of their pupils. Moustafa et al., (2022) studied Egypt's Education 2.0 reform plan and its vision to integrate ICT into education. They found that though there are obvious advantages of this reform plan in developing education, they posited that technical issues should be addressed to grant the continuity of the plan in the future.

### **2.5.3 Continuous Professional Development (CPD)**

Continuous professional development (CPD) and Career-Long Professional Learning (CLPL) refer to the training programmes and courses that provide teachers with updated knowledge of the subject content, pedagogy strategies, and technology integration to improve their teaching practices and enhance learners' academic performance (Beck & Kennedy, 2018). The aforementioned types of knowledge aim to enhance teacher's competency in the subject matter content, pedagogical approaches, and technology skills. They are designed to enable teachers to recognise the significance of integrating ICT into their pedagogical practices to deliver meaningful learning experiences (Minea-Pic, 2020). These courses, in return, can positively affect pupils' academic performance and improve their learning

experiences (Al Asmari, 2016). It is, therefore, important to provide teachers with effective professional development programmes or courses to develop their technology skills and make them able to employ ICT in their pedagogical practices (Parsons et al., 2019).

Several studies discussed the effect of CPD on the success or failure of ICT integration in teachers' pedagogical practices. According to Bates and Morgan (2018), professional development has a positive effect on "teacher knowledge and practice" (p.623). They posited that professional development training enhances teachers' knowledge of the subject content and enables them to employ different teaching strategies that suit pupils' individual learning needs. Egert et al. (2018) reviewed the literature that discusses the effect of teachers' professional development on pupils' academic performance. The findings revealed that the professional development of teachers' pedagogical knowledge has, positively, affected pupils' academic outcomes. Tondeur et al. (2016) explored the motivating and impeding factors that affect teachers' efforts to integrate ICT in their teaching practices. The study revealed that the regular provision of ICT professional development programmes was one of the success factors that has enabled teachers to, sustainably, integrate ICT in their teaching and learning practices . Fernández-Batanero et al. (2022) explored the literature that discussed the effect of professional development on teachers' ICT competency. They posited that ICT competency was one of the challenges that need to be addressed to grant successful ICT integration. They further concluded that ICT professional development enhanced the quality of teaching and learning practices. Furthermore, Derakhshan et al. (2020) studied the relationship between professional development and the success of EFL teachers in their teaching practices. They found that teachers perceived professional development as a significant factor for their success in teaching profession. They posited that these professional development programmes should meet teachers' professional development need. They further contended that stakeholders should involve teachers in designing these programmes to reflect

their needs and provide them with unmissable learning experiences that leads to the successful integration of ICT into their teaching practices. This way stakeholders can design CPD programmes that address teachers' needs and sustain their aspirations to improve their ICT skills (El-Bilawi & Nasser, 2017). It can also encourage teachers to recognise the significant role of technology in developing teaching and learning and, thus, adopt better teaching practices to deliver the subject content efficiently. Developing teachers' technological skills can also enable them to employ ICT tools confidently (Merchie et al., 2018). Improving these skills enables teachers to to infuse technology into teaching approaches and provide pupils with better interactive learning activities.

#### **2.5.4 ICT Leadership**

School principals, heads of local authorities, and ministers are the key individuals who are responsible for the implementation of ICT initiatives and projects in education (Razak et al., 2019; Thannimalai & Raman, 2018). They form the team of senior leaders (SLTs) who either work on the local level at schools and Councils in decentralised systems or as in ministries of education at the country's national level in centralised systems (Ekberg & Gao, 2018). Local authorities of education implement the country's national ICT policy while SLTs manage the drafting and approving the policy and secures the required financial resources (Madani, 2019). School principals, senior teachers, and technology coordinators provide the technical aid and training for teachers. Those stakeholders have significant role in the swift and smooth integration of ICT in education . It is their responsibility to grant the right provision of the requirements of ICT to avoid any possible failure of technology initiatives/projects and education reform plans. Their role is significant in facilitating ICT integration in the education system. Their fundamental role in facilitating the success or failure of ICT integration process is documented in literature. SLTs have significant role in planning and supporting the implementation of ICT projects at schools and to ensure the

smooth integration of ICT at schools. Abdullah, (2024) studied the digital maturity at tertiary education in Egypt. He provided a model that consists of seven dimensions including leadership. He posited that leadership formed an essential part in integrating ICT into tertiary education. Their role was effective in enhancing pupils' digital maturity and transforming universities into digital education. This is to say that SLTs are able to lead the change and implement the country's vision about the significance of ICT integration (Christensen et al., 2018). Their leading position entails them to lay the basis for the success of ICT integration in education. They who draft ICT policy documents that describe the goals behind the ICT integration, the vision of ICT initiatives and projects, define the expected effects of these initiatives on the development of teaching and learning. Therefore, SLTs should lead the change at schools and local authorities to guarantee the success of ICT integration. Leading the change for SLTs necessitates an expansion of teachers and other staff members' involvement in decision making (Eyles, 2018). Moreira et al. (2019) analysed Spanish teachers' perceptions of the leadership's role in facilitating ICT integration in Spain. They found that leadership has a significant role in the integration process of ICT into education.

The role of SLTs enables them to develop a type of ICT culture that recognises the immense opportunities that ICT can provide for the development of education and overcome the bureaucratic issues at the local and national level to ensure the smooth operation of ICT integration (AlAjmi, 2022). They always support teachers to use ICT as a tool for change to increase learners' engagement and improve their problem-solving and critical thinking skills. SLTs, therefore, endeavour to secure the financial resources needed for the implementation of ICT to improve teachers' competency in technology, pedagogy, and content. They dedicate these resources to provide technology tools, secure reliable internet connection, technical support services, and training requirements for teachers (Caena & Redecker, 2019). They also endeavour to enhance teachers' pedagogical practices that support ICT integration in the

learning activities and provide them the related training courses. Performing these duties enhances teachers' level of pedagogy knowledge and increases their efficient technology skills to deploy ICT in their teaching practices. Håkansson Lindqvist and Pettersson (2019) investigated the role of school leaders in ICT integration at Swedish schools. The study findings revealed that school leaders played a significant role in facilitating the involvement of teachers and pupils in ICT integration. The findings also revealed that school leaders perceived the positive effect of ICT integration on teachers' teaching practices and pupils' academic performance. Also, Alqahtani and Rajkhan (2020) investigated the factors that affected the success of e-Learning programmes at tertiary education in Saudi Arabia. They found that ICT management was one of the crucial factors to the success of e-learning during the Covid-19 pandemic. The findings revealed that ICT management has increased teachers and pupils' technology skills and provided technical support to facilitate the successful implementation of ICT. Furthermore, Day et al. (2020) argued that leadership can, positively, affects the development of ICT and improves the school management. They perceived role of school leaders as significant in "sustaining a positive school culture" (p.6). They concluded that school leaders facilitate the required conditions for teachers to perform their teaching practices to enhances pupils' academic outcomes.

Successful SLTs share with teachers and other staff members the vision of the initiative and also consider their perspectives of it too (Sun & Gao, 2019). They also takes into consideration the role of learners and their parents in the integration of ICT in education. They believe that most learners nowadays are knowledgeable in technology and can recognise the role of ICT in developing their learning (Scully et al., 2021). They also do not ignore the role of parents in the integration of ICT. They view parents as the first source of knowledge for learners and the supporters of combating learners' ICT literacy. Hammer et al. (2021) considered parent's role fundamental to their children' use of ICT in their learning.

They argued that parents' beliefs about the significance of technology in education supports the school and teachers' efforts in integrating ICT in learning. The home-schooling notion for SLTs is about linking parents to the school and update them with their children' learning development and shortcomings. Jeynes (2018) introduced a model of "parental –involvement and -engagement" that enables school leaders to understand parents' role in supporting their children' learning (p.147). He contended that school leaders are always keen on "increasing the levels of family connectivity with the schools" to develop pupils' technology skills and enhance their academic performance (ibid). This, in return, encourages learners to form positive attitudes towards ICT and increases their motivation to improve their academic performance. Parents' enthusiasm also motivates them to cooperate with SLTs to guarantee quality education for their children (Barakabitze et al., 2019). SLTs, therefore, should support teachers' efforts to involve parents in their children's effective use of ICT in their learning at home. They should always support parents' efforts to encourage their children develop their technology skills.

### **2.5.5 ICT Policy**

The Economic Commission for Africa (ECA) defined ICT policy as the "integrated set of decisions, guidelines, laws, regulations, and other mechanisms geared towards directing and shaping the production, acquisition, and use of ICT" (Chavula & Chekol, 2011 p.256). Education policy defines the vision of the government of ICT integration and the required strategies that fulfil this vision. This includes the construction of ICT infrastructure, the facilitation of human and financial resources, and the provision of professional training programmes. Several studies have found that ICT policy has a significant role in reforming education. Burbules et al. (2020), for example, found that education policy was one of the improvements that education has seen. They considered policy as an essential part of education quality that governs the process of ICT integration and organises the administrative

issues which guarantees the smooth and safe integration of ICT. Malik (2018), also, posited that the promising effects of ICT integration in education requires changes of various aspects in the education system. He argued that policy is one of these changes that is required for “transformative use of educational technology” (p.11). He further concluded that ICT policy reflects the country’s strategic plans to promote teachers’ technology skills and pedagogical knowledge for an effective integration of technology in education. Aziz (2020) investigated the influence of ICT policy on ICT integration to overcome the issue of “digital divide”. He said that the successful implementation of these policies depends on the cooperation of different agencies on the local and national levels. He considered ICT policy “ambiguous” if it ignores the barriers that affect the process of ICT integration (p.304).

The question arises here: What are the factors that can affect the success or failure of those agents in implementing ICT in education? The answer to this defines three main factors as indicators to the success or failure of the ICT integration process. The first factor is the misinterpretation of ICT policy (Rana et al., 2019; Janssen & Helbig, 2018). Hammond (2014), for example, explored the vision of ICT policy and its expected effect on the development of teaching and learning. He found that the policy focused on providing schools with technologies rather than developing the technology pedagogies. He concluded that this issue has affected the actual implementation of ICT in “practice” (p.5). Policy misinterpretation can come in different forms. Education stakeholders may interpret their perspectives of ICT integration to a heavy emphasis on providing technology tools over the development of teachers’ pedagogical and technological skills. Local authorities and school administrators may believe that teachers only need to have enough technology tools in place and there is no need to develop their teaching practices (Glewwe et al., 2021). They may also hold an assumption that teachers are good enough to use these technologies, and they already have enough knowledge about teaching approaches. This perception of ICT policy vision

could prevent teachers from training opportunities they are in a need for them to update their ICT pedagogical knowledge. It could also lead to the distortion of ICT policy and the rapid failure of the integration process.

The second factor is the lack of stability. According to Asongu and Nwachukwu (2016) political stability is the driving force for better education. They argued that the role of education is vital in diminishing conflicts and leads to stability. They posited that countries that enjoy political stability are able to design permanent political policies that lead to better and permanent education outcomes. Tedla (2012) investigated the factors that affected the integration of ICT in teachers' instructions at the developing countries. He argued that political unrest was one of barriers that affected the process of ICT integration. He also argued that this type of instability puts pressure on schools and local authorities to adhere to these prompt changes and would affect their efforts to integrate ICT successfully. Thus, the political unrest in a country could lead to the lack of stability and therefore, would lead to the election or appointing of successive governments with different educational perspectives in short period. These government may propose major changes on the existing ICT policy or radically curtail it and draft a new policy that expresses their views about the reform plans of education.

The third factor is concerned with senior management's style of supervision in education- e.g., centralisation vs decentralisation. Centralised management of education is still a common and even a favoured approach in many developed and developing countries, however, these countries differ in their ways of implementation. This style depends on a hierarchical system that controls all the resources and decisions related to the process of ICT integration under a highly centralised level of authority (Kostas, 2020). This is mostly a ministry that issues all the legal procedures and provides local authorities with the financial resources and technology tools. Ministries in centralised education systems may allow local



authorities or school principals a limited level of involvement in the implementation of the ICT policy. Teachers' perspectives of ICT integration and their training needs are rarely considered. Decisions about the provision of ICT technology and the related training programmes are always managed by the ministry. Local authorities' role is limited to receive the ICT tools and organise the installation and operation of these tools. Training programmes are always announced by the ministry then local authorities nominate trainees and the training venues. Allam (2021) investigated the significance of adopting a decentralised education system reform in Egypt. She contended that the current education system still centralised as the "decision and policymaking remained hierarchical" (p.11) and managed by Ministry of Education and Technical education (MoETE). She concluded that this type of centralised education system has negatively affected the quality of education outcomes. Bush and Ng (2019), also, examined the reform plan in the Malaysian education system. They contended that this plan encourages school leaders to adopt a distributed leadership style instead of the administrative style which is dominant in most schools. They found that the Malaysian education system is highly centralised, and it could be difficult to change it as planned. They concluded that the adoption of distributed leadership can develop the current school leaders' beliefs and practices and enhances pupils' learning outcomes.

By way of contrast, decentralised management of education empowers local authorities and school management in implementing ICT policy. Bush (2016), for example, examined the significant role of decentralised leadership in the success of school management in England. He discussed how school leadership was structured and processed in England and their effective influence on educational outcomes. He found that the role of school leadership was significant in the development of teaching and learning practices. In the decentralised management systems, Ministry of Education outlines the guidelines of the curriculum, the national vision, and the expected outcomes of education (Guha &

Chakrabarti, 2019). The ministry is also responsible for approving the legal procedures and the required financial resources for the process of ICT integration (Dick-Sagoe, 2020). The local authorities and school management then manage the entire process of teaching and learning including the implementation of the ICT policy. Their interpretation of the ICT policy usually reflects the needs of the local community and align it with the country's vision of education. They also create customised ICT integration plans that suit the community or school's educational requirements.

Decentralised education systems also consider the crucial role of teachers in the effective integration of ICT policy. Several studies contended that teachers should have active role in any proposed ICT policy studies (see for example, Gobby and Niesche, 2019; Aziz, 2020; Hanafizadeh et al., 2019; Janssen & Helbig, 2018; Madani, 2019; Verger et al., 2019). These studies contended that failure to notice teachers' role could lead to adverse effects on their decision to use ICT in their pedagogical practices. According to Gobby and Niesche (2019) decentralised school leadership supported education reform in Western Australia and increased the role of local communities in the development of school "autonomy" (p.565). They found that "community empowerment" enhanced the functions of school leadership and provided new paths of "thinking about and undertaking schooling" (ibid). They contended that school management should reflect teachers' perspectives, worries, and needs into the ICT policy. This way, teachers are able to provide their feedback about the policy and propose practical solutions to increase its efficiency and the consistency of the integration process for long term (Verger et al., 2019).

#### **2.5.6 Teacher's beliefs and attitudes towards ICT integration**

Beliefs refer to the set of perspectives that individuals form about specific issues to assess new realities in their surrounding environments, express consciously or unconsciously their views about them then draw conclusions to form their final perceptions or judgments

(Rotter, 2021). These conclusions can inform the success or failure of an initiative or a project. The system of teachers' beliefs is problematic and can be, sometimes, difficult to assess directly (Pressley & Ha, 2021; Burić & Moe, 2020). The effect of these beliefs on the process of ICT integration in education is documented in literature. Several studies posited that teachers tend to adopt different teaching pedagogies to reflect their beliefs about the subject matter content and the efficiency of ICT in transferring this content (See for example, Borg & Alshumaimeri, 2019; Ifinedo et al., 2020; Nugroho & Mutiaraningrum, 2020; Birisci & Emin, 2019; Leem & Sung, 2019). These studies argue that teachers' level of self-confidence in their technology skills can affect their beliefs about ICT integration. Birisci and Emin (2019), for example, argued that teachers' beliefs about their self-efficacy was one of the success factors of ICT integration in their study about pre-service teachers' predictors of technology integration in Turkey. They found that teachers who form low levels of beliefs about their efficacy in ICT tended to employ "teacher-centred" approaches instead of infusing technology in their teaching practices (p.77). Nugroho and Mutiaraningrum (2020) studied the beliefs of EFL teachers in Indonesia about ICT integration in their teaching practices. They found that factors such as "personal and contextual challenges" affected teachers' beliefs about the significant effect of ICT on teaching development (p.314). Shaukat et al. (2019) also studied the characteristics of special education teachers and their effect on teachers' beliefs about ICT. They found that teachers' beliefs increased their self-efficacy and tended to support learners' individual learning needs. Thus, teachers form their beliefs about ICT this way. They observe ICT tools, explore their features, recall their individual experiences with technology, then assess the potentials of these tools to decide their effect on the development of teaching and learning (Mukminin et al., 2019). After that, they form their intentions to integrate these technologies in their teaching practices as long as these technologies can enhance pupils' learning outcomes. Teachers who have low level of self-

confidence in their ICT skills perceive technology as an extra burden and hesitate to use it or even reject it totally (Barni et al., 2019). They tend to focus on negative aspects such as breakdowns and time wasting. They always encourage pupils to use pre-arranged technology activities that they-the teachers- trust and are in control of them. They believe that technology this way will lead learners to success and achieve higher grades. They tend to adopt a teacher-centred pedagogy as they believe that ICT has a restricted role in learning and tend to be the sole source of knowledge. Nordlöf et al. (2019) found that teachers who believe that they do not have enough knowledge about technology tend to avoid learning activities that require the use of ICT. They contended that those teachers always feel that their self-efficacy is not enough to conduct these activities, and they feel comfortable avoiding ICT integration in their teaching.

Conversely, teachers with high-level of confidence in their technology abilities see themselves capable to, effectively, employ technology in their teaching practices (Wilson et al., 2020). They always have positive attitudes towards technology and low levels of anxiety when employing ICT in their teaching practices. Poulou et al. (2019) argued that teachers' beliefs about their ICT skills is related to their ability to adopt better teaching approaches to promote pupils' learning outcomes. They concluded that teachers with high self-efficacy formulate positive attitudes towards ICT integration more than those with low self-efficacy. They tend to continuously develop their ICT skills and keep themselves updated with recent technologies. They also encourage their learners to adopt positive views about technology and to keep using it in their different learning activities (Fathi & Ebadi, 2020). They tend to employ a more constructive student-centred learning approaches if they trust their ICT skills and, therefore, provide learners with interactive learning activities. Therefore, it is the responsibility of stakeholders to encourage teachers to articulate their beliefs about the significance of ICT integration and to take part in this process. Teachers' desire to understand

the practices that lead to better teaching and learning can be the starting point to shape their beliefs. These beliefs, in return, will support teachers' efforts to use ICT in all areas of the curriculum to enhance learners' learning experiences.

The successful implementation of ICT in education depends on teachers' attitudes towards the integration of ICT. If the surrounding circumstances support teachers, they can form positive attitudes towards ICT integration and adopt contemporary teaching approaches. Teachers are also able to form their attitudes towards ICT integration if they recognise the benefits of these tools in developing their teaching practices. This type of recognition can enable them to strengthen their self-efficacy and beliefs about the importance of ICT integration. Miranda et al. (2021) said that the idea is not only about how teachers use technology to deliver the subject matter content but how they blend technology into their pedagogical practices to deliver meaningful content. Similarly, Arcueno et al. (2021) said that the lack of technological skills and professional development training can form obstacles for teachers to integrate ICT in their pedagogical practices. They considered teachers' limited knowledge of how to blend teaching approaches with educational technologies form a challenge for teachers. They said that this issue can affect teachers' ability to plan ICT- based learning activities that increase pupils' level of interaction. Therefore, integrating ICT into pedagogical practices is not only concerned with the improvement of traditional teaching approaches, rather it is about the adoption of new pedagogies that enable teachers to expand pupils' level of engagement. It is about shifting from traditional lesson plans based on teacher-centred approaches to a more student-centred approaches that support collaborative learning, encourage active engagement, and help pupils in controlling their learning.

#### **2.5.7 Teachers' pedagogical knowledge**

Teachers are the key actors in the educational system and the primary source of knowledge for pupils. They play crucial role in defining the reasons for utilising or

abandoning ICT in their teaching practices (Barni et al., 2019). Initial teacher education (ITE) is considered the primary source which enables pre-service teachers to form their beliefs and attitudes towards ICT integration. This is to say that prior to the initial teacher education programme (ITE), pre-service teachers formulate their views of the teaching profession and what it requires to be effective teachers (Gudmundsdottir & Hatlevik, 2018). They then join the programme with a set of personal beliefs about pedagogy, technology competence, and the use of ICT into education. Starkey (2020) said that initial teacher education improves pre-service teachers' "digital competencies" and strengthen their beliefs about the significance of ICT integration in the enhancement of their teaching practices (p.7). Farjon et al. (2019) also found that pre-service teachers' "attitudes and beliefs towards technology" was one of the factors that affect their intention to integrate ICT in teaching and learning. Furthermore, Flores (2020) considered initial teacher education (ITE) as "a key context" for the development of student teachers' "professional identity" (p.1). She contended that this identity affects student teachers' beliefs about teaching and learning.

During the course of the ITE programme, pre-service teachers discover the importance of adopting pedagogies that employ technology and the role of these pedagogies in effective delivery of the curriculum. Bedir (2019) explored the beliefs of ELT pre-service teachers in Turkey about the integration of ICT in their future teaching practices. He focused on the role of technology integration in developing student teachers' 4Cs skills (i.e., critical, creative thinking, collaboration, and communication). The study findings showed that pre-service teachers perceived the significance of ICT technology in the development of teaching and learning. However, he contended that the current curriculum at teachers' education did not focus on developing student teachers' 4Cs skills and they did not receive proper training about ICT integration. Another interesting study by Falloon (2020) was about initial teacher education. Falloon perceived the "better-preparing" notion of pre-service teachers' education

as problematic (p.2450). He argued that pre-service teachers need to understand the significance of ICT integration in developing competent and creative teaching practices. He further contended that teacher education should enhance “teacher digital competence”. This, in return, could help them planning interactive learning activities that promote pupils’ academic performance (ibid).

Literature confirms that teachers with robust knowledge of the subject matter content, pupils’ learning needs, pedagogical strategies, and competent technology skills surpass unknowledgeable teachers (see for example, Kind & Chan 2019; Dong et al., 2020; Gess-Newsome et al., 2019; Elas et al., 2019; Doukakis et al., 2021; Fahadi & Khan, 2022). Kind and Chan (2019) posited that teachers are always keen to convey their knowledge to pupils through different strategies and tools. They argued that the development of teachers’ knowledge can positively and /or negatively affect the quality of their teaching practices and enhances pupils’ academic performance. This knowledge is concerned with the subject content, the pedagogical approaches, and educational technologies (Celik, 2023). It is a type of theoretical and practical knowledge that pre-service teachers gain during the ITE programme. It is vital for them to decide whether they will utilise or abandon technology in their future teaching practices. These types of knowledge are essential for pre-service teachers to support their efforts in delivering meaningful teaching and learning. This type of knowledge forms the triad of Mishra and Koehler’s (2006) TPACK framework as discussed earlier in this chapter. This robust knowledge enables teachers to integrate ICT to enhance their “effectiveness” in the delivery of the subject matter (Santos & Castro, 2021, p.1). Koh (2019) examined the effect of the TPACK scaffold design on teachers’ perspectives of ICT integration. She found that this design enabled teachers to change their pedagogical practices and employ teaching practices that use ICT. Lachner et al. (2021) conducted a study about the training courses which focus on explaining the TPACK knowledge and how they enabled

pre-service teachers to improve their knowledge of content, pedagogy, and technology. They found that these courses enhanced student teachers' "technology-related self-efficacy" that positively affected their intention to integrate ICT in their teaching practices (p.1). Fahadi and Khan (2022) also investigated the significance of the TPACK knowledge for engineering teachers. They concluded that availability of technology was not the sole factor that supported teachers' integration of ICT. Rather it was the mastery of the different types of the TPACK knowledge which enabled teachers to employ "technology-enhanced instruction" in their pedagogical practices (p.519). Gess- Newsome et al. (2019) contended that professional development has enabled teachers to change their knowledge about teaching and learning and gain new knowledge that support their teaching practices. Furthermore, Doukakis et al. (2021) posited that teachers should not limit their knowledge to the know- how of operating ICT technologies but to integrate these technologies into their teaching practices efficiently. These studies imply that the development of teachers' pedagogical knowledge enables them to recognise the role that ICT can play in changing their traditional teaching approaches to more sophisticated methods. Teachers tend to employ these types of knowledge and use ICT tools that fit within the pedagogical approaches they use to support learners' learning performance (Arcueno et al., 2021). They always try to find out proper channels they can use to communicate the curriculum content to their learners. They do not depend on each type of this knowledge separately or favour one type to another. Rather, they believe that excelling in the subject matter is not enough if they do not integrate ICT into their teaching approaches to encourage collaborative learning (Chen & Jang, 2019). The more they excel in these types of knowledge, the better they adopt technology into their future teaching practices. In a study conducted by Akram et al. (2022), they found that participants (i.e., teachers) perceived the significant role of ICT integration in the development of their pedagogical practices. They concluded that ICT integration has enabled participants to provide pupils with "exciting and



interactive” learning experiences that increased their level of interaction, and they were motivated to learn further knowledge (p.1). They contended that teachers have employed the audio/visual features of ICT such as presentations, virtual experiments, and videos to attract pupils’ attention and increase their level of interaction and motivation. This, in return, has encouraged teachers to adopt pupil-centred learning approaches to increase pupils’ level of attainment (Ranta et al., 2023; Jacob et al., 2020). This is to say that integrating ICT technology into pedagogical practices enables teachers to use the advanced features of technology to manage and control learning activities. Technological pedagogical knowledge enables them to change their beliefs about ICT technology (Bragg et al., 2021). ICT utilisation is a process that enables teachers to shift from traditional teaching strategies to constructive teaching approaches that employ technology in all areas of the curriculum. ICT also enables teachers to remodel the classrooms activities from rote and memorisation activities to more interactive activities that employ technology into each activity.

## **Summary of Chapter Two**

This chapter reviewed the literature related to ICT integration in education. This review described the vital role of ICT in developing education. It also discussed the factors that could affect teachers’ decision to adopt ICT in their teaching practices. The reviewed studies defined education reform as a complex process and ICT integration as the infusion of technology in all areas of the curriculum to enhance education and enabling teachers to abandon traditional teaching approaches and adopt more constructivist approaches. These studies have considered technology integration as one of the major components of education’s reform plans that could help in the development of the whole education system. They also considered the significant role of the innovative features of ICT technologies in developing teaching practices that lead to the promising results of education reform. Literature defined the interaction of learning theories, pedagogical practices, and teachers’

beliefs as supportive to the prompt integration of ICT in teaching and learning. This interaction starts at ITE programmes which is the cornerstone in preparing pre-service teachers to, successfully, implement ICT in their future teaching practices.

During ITE programmes pre-service teachers recognise the role of learning theories and how they inform them how and why teach, what are the required skills to teach, and the factors that could lead to the success or failure of ICT integration. Learning theories offer the answers to these questions. Learning theories also form a theoretical framework that enables pre-service and in-service teachers to understand the significance of ICT integration in education. This framework describes the requirements for the integration process, the opportunities behind ICT integration and the barriers that could hinder it, and, finally, the proper solutions to abolish these barriers. The reviewed studies have shown that bringing theory into practice is the second step in ICT integration. These studies have contended that education stakeholders are responsible for paving the road to pre-service teachers to bring theory into practice. They suggested that stakeholders should plan effective ITE programmes that provide pre-service teachers with the required knowledge of pedagogy, content, and technology and prepare them for their future career. The studies have also suggested that stakeholders should empower in-service teachers with proficient training programmes to enhance their pedagogy and their knowledge of the subject content. This should provide teachers with up-to-date knowledge about the most contemporary trends in education and develop their technology skills as well. Teachers' pedagogical knowledge is an essential part that teachers should construct to ensure that ICT integration process is taking place into their teaching practices. These training programmes should enable teachers to accumulate knowledge about integrating technology into their teaching approaches to deliver the subject content efficiently. Therefore, it is the responsibility of the education stakeholders to device reform plans that enable teachers to recognise the essential role of ICT in developing pupils'

learning outcomes. Literature also discussed the provision of ICT infrastructure at schools and its significant role in the smooth integration of ICT integration. The reviewed studies considered the availability of technology tools at schools and classrooms could motivate teachers to use them in delivering the subject matter content in an attractive fashion. They also could enable teachers to adopt more constructive teaching strategies that encourage collaborative learning through interactive learning activities. However, to secure a continuous integration of ICT, literature informs that technical support is an essential factor that need to be available for teachers constantly to provide teachers with a sense of security while they employ these technologies into their teaching practices.

In the next chapter, I will discuss the methodological paradigms of this research that define its philosophical stances, recruitment procedures, research ethics, data collection methods, and the analysis of data.

## **Chapter Three**

### **Methodology**

#### **3.0 Introduction**

This chapter presents the methodological approaches underpinning this study. In this chapter, I will discuss the research design, the development of the research questions and methods employed to collect and analyse data. The purpose of my study is to investigate the experiences of Egyptian and Scottish secondary school teachers in implementing ICT in their pedagogical practices in the classroom. The study focuses on teachers' perspectives of integrating ICT in their teaching practices and investigates how they perceive the shift from traditional teaching approaches to the use of ICT in delivering the subject content.

#### **3.1 Development of a rationale**

Technology tools such as computers, the internet, mobile devices, software programmes, and digital tools fall under the umbrella of information and communication technology- ICT (Al-Rahmi et al., 2020). It increases teachers' productivity and ability to promote lifelong learning. The integration of these tools in education addresses the evolving demands of the 21<sup>st</sup> century's learning environment. It enables teachers to update their instructional strategies, improve their accessibility to technology, and supports pupils to become ready for a technologically advanced world ( Bai et al., 2016). ICT could also help teachers shifting from traditional teacher-centred approaches to a more effective student-centred approaches that utilise ICT tools for a better interactive and collaborative learning (Altan & Alkan, 2023). Furthermore, ICT can enhance teachers' classroom instruction as it provides them access to teaching resources and supplementary materials. It offers teachers and pupils with versatile resources and techniques that improve the efficiency of teaching and learning and makes it more engaging (Al-Rahmi et al., 2020). Furthermore, ICT can support

teachers in improving their teaching abilities and follow the latest developments in education by participating in online training courses, webinars, and online communities of practice.

Modern economy relies greatly on technology and necessitates that workforce should be equipped with digital skills. Integrating ICT in the classroom can enhance pupils' digital literacy and ensure that they are prepared to participate in and manage modern economy. Exposing pupils to ICT technologies enables them to gain fundamental skills in data analysis, coding, and digital communication. Utilising ICT resources such as smart/interactive boards, and mobile technologies such as iPad/tablets and smart phones promotes pupils' engagement and facilitates peer learning. This, in turn, increases their collaboration to share useful learning experiences and enhances their comprehension of complex ideas (Das, 2019). ICT-based activities can also enhance pupils' critical problem-solving skills as these activities require analytical reasoning and innovative solutions (Barakabitze et al., 2019). They can help pupils becoming familiar with industry-standard platforms and technologies that prepare them for a wide array of professionals in the future. Furthermore, ICT integration enables teachers to personalise education and addresses the individual learning needs of pupils. These tools can help teachers monitoring the progress of pupils and tailoring the subject content to suit each student's learning preferences at their own pace (Cha et al., 2020). These advantages of ICT and its ability to develop teachers' teaching practices and enhance pupils' academic performance form a robust rationale for the present study.

To investigate the significance of ICT integration in education, I employed constructivism as my theoretical framework and TPACK as my conceptual framework in the present study. Constructivism is one of the learning theories that provides a robust framework for the effective integration of ICT in education (Pande & Bharathi, 2020). The constructivist dogmas of active learning, knowledge construction, social interaction, and contextual learning create teaching and learning environments that support the successful integration of

ICT in education. Constructivist teachers actively engage their pupils in ICT learning activities and encourage them to brainstorm and recall their prior knowledge to form new ideas that develop their learning experiences (Aljohani, 2017). ICT can offer innovative resources which can help constructivist teachers improving the quality of their teaching practices. Integrating ICT in the classroom also enables constructivist teachers to adopt student- centred approaches to replace traditional learning methods. They tend to utilise smartboards, iPads/tablets and laptops to conduct interactive learning activities that facilitate peer learning, collaboration, increase level of engagement, and address pupils' individual learning needs. This, in return, should provide pupils with personalised learning opportunities that can enhance their cognitive skills such as critical thinking, creativity, and problem-solving.

To implement a constructivist teaching- learning approach, it is essential to enhance teachers' awareness of the role of ICT integration in their pedagogical practices (Guo, 2018). This requires providing teachers with in-depth knowledge of the best pedagogical practices that employ technology tools for successful delivery of the subject content (Koh, 2019). Thus, the utilisation of ICT in education from a constructivist perspective requires the development of teachers' technological, pedagogical, and content knowledge (Mohammed & Kinyó, 2020; Ifinedo et al., 2020). The components of the TPACK framework conceptualise this type of in-depth knowledge that is essential for novice and in-service teachers. This knowledge can improve teachers' pedagogical practices as TPACK focuses on developing their understanding of ICT utilisation in their teaching practices to provide pupils with constructive learning experiences ( Janssen et al., 2019). Therefore, it is necessary to equip teachers with the required ICT skills and encourage them using these tools into their teaching practices (Andyani et al., 2020). It is also important to provide teachers with relevant training programmes about the effective use of these tools in their pedagogical practices rather than

employing them as a replacement to traditional teaching approaches (Das, 2019; Fernández-Gutiérrez et al., 2020).

### **3.2 Development of the research questions**

One of the distinctive qualities of qualitative research is that it digs deep under the surface of the explicit conversations to understand how individuals form their perspectives of the truth or reality (McGregor, 2018). Qualitative researchers primarily conduct extensive review of literature to understand how the topic under study has been investigated in academia (Charmaz & Henwood, 2017). They initially form broader questions then narrow the review to refine the results and produce the research's main question. The researcher may also propose other subordinate questions for a thorough exploration of the phenomenon under study (Charmaz, 2017). This process differentiates qualitative research from quantitative studies (Cohen et al., 2018). The earlier tends to ask what, how and why questions to explore participants' views and experiences of the study phenomenon, while the latter focuses on presenting the phenomenon in rigid numbers (Moser & Korstjens, 2018).

I developed the main question and subordinate questions of the present research upon conducting an extensive review of the related literature to the topic under study. Part of the reviewed literature investigated teachers' experiences in integrating ICT in their pedagogical practices (see for example: Al-Rahmi et al. 2020; Das, 2019; Eyles, 2018; Fernández-Gutiérrez et al., 2020; Goh & Sigala, 2020; Hidayati, 2016; Ishaq et al., 2020; Kontostavlou & Drigas, 2019). Other studies investigated the factors that could affect teachers' acceptance or rejection of ICT integration in their teaching practices (see for example: Alqahtani & Rajkhan 2020; Adel Ali & Arshad, 2018; Leem & Sung, 2019; Gil-Flores et al., 2017; Pareja Roblin et al., 2018; Tondeur, et al., 2016; Nikou & Economides, 2021). The review of literature in addition to the guidance of my doctoral supervisors have enabled me to form the below question as the research's main question:

## **What are the experiences of secondary school teachers who integrate ICT into their pedagogical practices in the classrooms in Egypt and Scotland?**

In addition, I formed the below subordinate questions to extract further in-depth data that investigate the research topic thoroughly.

### **Subordinate questions:**

- 1- What are the perceived advantages of ICT integration at secondary education in Egypt and Scotland?*
- 2- What are the perceived difficulties of ICT integration at secondary education in Egypt and Scotland?*
- 3- What are the similarities and differences between Egypt and Scotland regarding ICT integration at secondary education?*

## **3.3 The research approach.**

### **3.3.1 Ontological and Epistemological issues**

Ontology and epistemology are the philosophical stances of the research that enable the researcher to interpret her/his views of the world when studying a phenomenon in its natural context (Joslin & Müller, 2016). Defining the ontology and epistemology of the study helps the audience understanding the researcher's perspectives of the world and how she/he constructs the truth or the social reality (Hoddy, 2019). Lawson (2019) referred to ontology as "all those phenomena whose existence depends necessarily on human beings and their interactions" (p.3). He contended that ontology enables the researcher to recognise the nature of the phenomenon and its "essential properties" to formulate the possible ways of interacting with it (ibid). Ontology identifies how the researcher understands, constructs, and interprets the social reality into meanings that describe it (Farghaly, 2018). This implies that ontology lends lenses to the researcher to recognise reality in its social context and examines how it



was formed and why it existed (Al-Ababneh, 2020). On the other hand, epistemology is defined by Fricker et al. (2020) as “the interdisciplinary inquiry into the myriad ways humans socially acquire, create, construct, transmit, store, represent, revise, and review knowledge, information, belief, and judgment.” (p. xvi). Epistemology forms the philosophical foundations of the research. It helps the researcher to realise the adequate nature of knowledge and justifies how individuals perceive it and make sense of it then decide on accepting or rejecting it. It can be said that both ontology and epistemology are the constructs of the study. These constructs enable the researcher to define her/his philosophical positioning in the research, form her/his perspectives of the reality, and develop her/his views about it.

In the present study, I employed a constructivist epistemology to understand the experiences of secondary school teachers in Egypt and Scotland in integrating ICT in their pedagogical practices. Constructivist epistemology is an interpretive approach which enables researchers to conduct an in-depth investigation to understand the phenomenon under study (Bogna et al., 2020). This approach enables researchers to define participants’ experiences of the phenomenon under study and how they managed to overcome the surrounding barriers and benefit from the opportunities it may provide (Brown et al., 2020). Constructivists recognise the researcher’s role as dependent on participants’ experiences of the phenomenon, and how she/he interprets these experiences into an array of versatile ideas to enrich the research data. Charmaz (2017), said that “reality” is a social process that is formulated by individuals through the interaction of their prior knowledge with the new truth or knowledge they observe within the surrounding environment (p.38). Creswell and Creswell (2017) contended that individuals develop “subjective meanings of their experiences” of the reality then form their perspectives of it (p.8). This is to say that individuals tend to construct the new knowledge or reality when they observe the phenomenon and interact with it (Burr &

Dick, 2017). During interaction individuals recall their prior knowledge to examine the new reality and form their views of it (Kahn & Winters, 2021). These views are unique to each individual as she/he perceives the *reality* of the phenomenon from her/his own experiences. They then form their different perspectives about it (Rob & Rob, 2018). ICT integration in the current study is the reality which participants interact with it in the classroom. It is the reality that they have formed their experiences about it while tending to utilise it in their pedagogical practices. Participants, at first, have recognised ICT as an existing phenomenon in the surrounding environment (i.e., the classroom) then started to employ these tools in their teaching practices to deliver the subject content. Before participants could decide to accept the new reality or reject the whole integration process, they form their experiences with these tools. These experiences could help them deciding whether they should employ or abandon them (Holstein & Miller, 2017).

### **3.3.2 Qualitative methods**

It is essential for a researcher to decide the type of the research approach that reflects the aims and goals of the study she/he tends to conduct (Timans et al., 2019). The type of research method positions the study within the relevant academic discipline and provides the audience with better understanding of the phenomenon. Selecting the proper method for the research depends on the type of reality or truth the researcher tends to discuss within the study (Treagust & Won, 2023). Quantitative and qualitative methods are the dominant research methods in the field of educational research (Dawadi et al., 2021; Mertens, 2019). These methods can be employed separately or combined in a mixed method approach (Bleiker et al., 2019). Each method generates specific type of data sets that describe the phenomenon under study in different ways (Lambert, 2019; Aspers & Corte, 2019). Quantitative method is a positivist approach with a rationalistic and logical framework (Johnston et al., 2019). It is a deductive approach that does not entail human experiences

when studying a phenomenon (Hosseini et al., 2019). In this approach, individuals do not have a role in shaping their experiences of the truth or social facts. Rather it is the society that forms their experiences of these facts (Bloomfield & Fisher, 2019; Mohajan, 2020). Quantitative researchers propose a set of hypotheses for testing and ask questions that produce quantifiable answers that can be scaled (e.g., 1-5) (Johnson & Christensen, 2019). These answers enable the researcher to define the status of the phenomenon under study and investigate the related causes that have led to its existence (Mohajan, 2020). On the other hand, qualitative research is a constructivist approach that is concerned with how individuals perceive reality or truth (Alam, 2021). Cohen et al. (2018) contended that this approach “...draws the researcher into the phenomenological complexity of participants’ worlds” (p. 544). It helps the researcher understand participants’ perspectives of the phenomenon under study. It is an inductive approach that enables the researcher to interpret individuals’ experiences of the phenomenon under study (Tomaszewski et al., 2020). It is similar to an excavation process that digs deep under the surface to extract hidden meanings and provide tangible findings (Aurini et al., 2021; Busetto et al., 2020).

This research uses a case study design to explore and compare the experiences of secondary school teachers in integrating ICT into their pedagogical practices in the classroom in Egypt and Scotland. Scholars have provided several definitions of the case study design. Yin (2018), for example, defined a case study design as an “empirical inquiry that investigates a contemporary phenomenon (the “case”) within its real-world context”(p.15). The design enables the researchers to identify an existing phenomenon and form an understanding of the conditions relevant to its existence. Cohen et al. (2018) also said that a case study “ provides a unique example of real people in real situations, enabling readers to understand ideas more clearly than simply presenting them with abstract theories or principles” (p.376). In the present research, ICT integration at secondary education in Egypt

and Scotland is an existing phenomenon or a “case” that requires an in-depth exploration of participants’ experiences with it. This in-depth investigation can provide answers about how participants perceive the phenomenon, what are their experiences with it, and how they have come over the obstacles they have faced. These answers should help the audience to understand why participants have chosen to adopt or reject ICT integration in their pedagogical practices and how they have utilised ICT in their daily pedagogical practices to produce better teaching and learning experiences.

Stake & Vesse (2022), said that conducting a case study has been recognised as an approach that enables the researcher to “... understand the scene and the stories of those involved” then hold a comparison between these stories to produce a final picture about the existing reality (p.91). This type of comparison enables the researcher in the field of education to define the similarities and differences between the contexts of the study. It also enable the researcher to recognise the effect of different factors such as education policy, curricula, school infrastructure, and institutional support on the reform plans of education. Although digging for answers into a single context can offer reasonable answers to these inquiries, however searching and comparing two or more contexts can provide more in-depth understanding of the phenomenon (Schoch, 2020). This in-depth analysis of different educational systems functioning under various socioeconomic, cultural, and political circumstances justifies the employment of a case study design in the present research (Thomas, 2021). This is what White and Cooper (2022 ) referred to as the “ concrete case” that is “bounded within social, political, cultural and historical contexts” (p.252). The case study design of the present research was employed to define the existing similarities and differences between Egypt and Scotland in integrating ICT within their secondary education. Furthermore, the unique socio-economic and cultural circumstances of each country signifies the use of a case study design to investigating how these factors have influenced the

integration of ICT within secondary education in each country. While Scotland, as a developed country, has a more established educational system and access to cutting-edge ICT technology, Egypt, as a developing country, faces problems such as fragile ICT infrastructure, limited financial resources, and digital literacy issues. These distinctions between Egypt and Scotland highlights the necessity for analysing each case individually and define the common similarities and differences between their approaches in integrating ICT at their secondary education.

### **3.4 Recruitment and sampling**

Recruiting a sample for qualitative research depends on the type of study topic, the logistic factors such, access restrains, financial resources, and geographical boundaries as well (Cohen et al., 2018). These factors could affect the researcher's decision to either select one participant to be the sole informant of the study or a group of individuals from within the sample category who can be representative of the population (Staller, 2021). In the coming sections, I will discuss the recruitment strategy, the type of sampling method, and the characteristics of participants as well.

#### **3.4.1 Recruitment Strategy**

A recruitment strategy is an essential component of the research methodology the researcher should consider in the primary phase of the research planning. Cohen et al. (2018) posited that "the quality of a piece of research stands or falls not only by the appropriateness of method and instrumentation but also by the suitability of the sampling strategy that has been adopted" (p.100). They argued that it is important for a researcher to select a suitable recruitment strategy that supports the goals of the study and enhances the quality of the research findings. There are two types of sampling strategies: probability and non-probability (Gill, 2020). The probability sampling strategy is a random sampling method that is mostly

employed by quantitative researchers . In this strategy, each member of the population has the chance to be included in the sample. Sample size in this strategy requires the selection of a large number of participants (Pace, 2021). Quantitative researchers use this strategy to guarantee that the final sample is a representative of the whole population. They tend to use sampling strategy to strengthen the statistical analysis of data and draw conclusions and findings that can be generalised to the entire population (Bloomfield & Fisher, 2019). The non-probability sampling strategy, on the other hand, is mostly used in qualitative research. It is a purposive and convenience sampling strategy that enables the researcher to select a specific number of participants whose characteristics are relevant to the study topic (Cohen et al., 2018). This method depends on recruiting a small number of participants. Their participation is always based on their ability to provide relative information to the study phenomenon (Creswell & Creswell, 2017). The non-probability sampling strategy does not tend to generalise the findings to the whole population, rather it aims to provide in-depth investigation of the participants' experiences of a particular phenomenon in its natural context (Denzin et al., 2024).

### **3.4.2 Sampling method**

The selection of a study sample is an essential element in the research design as it has a direct impact on the research's ethics, validity, and reliability (Bloomfield & Fisher, 2019) . It depends on the type of the research design whether it is a qualitative, quantitative or a mixed method. The selection of research design enables the researcher to employ the relevant sampling strategy and can, roughly, think of the number of participants who might resemble the sample and reach the level of data saturation (Creswell & Creswell, 2017). In the present research, I employed snowball sampling which is also known as chain sampling or network sampling. It is a non-probability sampling method that is widely used in qualitative research (Chambers et al., 2020). It is also a flexible, efficient, and cost-effective method that enables

the researcher to recruit participants with specific characteristics who can best describe the study phenomenon (Berndt, 2020). Participants in this method are recruited through referral technique (Mishra & Alok, 2022). The researcher either chooses the initial participant from his/her network of acquaintances or may receive a referral for a potential participant (Aspers & Corte, 2019). Once the initial participant/referral agrees to take part in the study and to be interviewed, the researcher asks him/her to nominate one further referral from within his/her social network or place of work by the end of the interview. The interviewer should confirm with the initial contact that the referral has the required characteristics that match the research criteria, and he/she is willing to take part in the research. Heckathorn and Cameron (2017) described the snowball sampling process as waves that “expands from wave to wave in the manner of a snowball growing as it rolls down a hill” (p.102). This procedure continues to grow as a rolling snowball until the researcher reaches the point of data saturation (Ellis, 2021).

Hewson (2020) contended that “ qualitative researchers often strive to obtain data from individuals who represent groups of particular interest and relevance to their research domain.” (p. 645). One of the characteristics of snowball sampling is its ability to access vulnerable and impenetrable groups of the society. These groups are normally characterised as hidden because they are stigmatised or hard- to- reach due to the restrictions imposed by the gatekeepers of the facility such as executive managers or school principals or head-teachers (Parker et al., 2020). Cohen et al. (2018) defined the researcher an “outsider” to this type of population and could face resistance to approach them or to obtain the permission to access the facility. This applies to me as I am an “outsider” to participants in the study contexts (i.e., Egypt and Scotland). I recently relocated to Scotland to study for my PhD degree and do not have a social network. Members of my extended family, acquaintances, and friends are mainly in Egypt. Furthermore, I started to collect data during the COVID

pandemic. Schools were then closed in both countries (i.e., Egypt and Scotland) and I was not able to travel to Egypt or meet participants in person due the lock down restrictions.

In Egypt, I formed the study sample by approaching one of my acquaintances who referred me to another potential participant. My supervising team sourced one participant who introduced me to a potential referral by the end of the interview. By the end of each interview, I used to ask each interviewee if he/she can introduce me to a potential referral who can fit within the sample category and has the required characteristics. These characteristics focused on secondary school teachers who use ICT tools such as computers, smartboards, and tablets/iPads in their daily pedagogical practices. This specific type of teachers is the targeted population of the present study. Primary school teachers and tertiary lecturers were excluded as they did not fit into the scope of the present study, however they could be considered in future studies (Etikan et al., 2016). This process continued till I was able to form the sample (Braun & Clarke, 2019).

Proponents of quantitative sampling criticised the referral technique of the snowball sampling. They built their critique on the basis that snowball sampling does not have a sample framework or specified population that researchers can use to recruit an appropriate sample. This means that individuals in the population do not have an equal opportunity to be included in the sample and, therefore, findings cannot be generalisable (Pandey & Pandey, 2015). Furthermore, they consider data collection from random sampling is the “gold standard” which can produce generalisable findings (Bloomfield & Fisher, 2019, p.29). On the other hand, proponents of qualitative research refute this criticism (See for example: Braun & Clarke, 2019; Cardano, 2020; Nassaji, 2020; Lester et al., 2020; Aurini et al., 2021; Sims & Fletcher-Wood, 2021; Maxwell, 2021; Carminati, 2018). Those scholars based their refutation on the grounds that qualitative researchers cannot construct a sample framework if the population is defined as hidden or hard-to-reach due to restrictions imposed by the



gatekeepers (Ellis, 2023). They further contended that generalisability of the findings is the not main purpose of qualitative research. Rather it tends to generate themes from the data to provide thick and rich description of the phenomenon under study (Gřundělová et al., 2024). This is what Creswell and Creswell (2017) defined as “ the value of qualitative research” (p.201). They contend that “Particularity rather than generalizability is the hallmark of good qualitative research.” (ibid). The interpretation of the participant’s particular experiences of the phenomenon and how they perceive it enables the researcher to form distinctive knowledge from the diverse experiences of the participants and provides an in-depth understanding of the phenomenon (Kirchherr & Charles, 2018). Therefore, snowball sampling as a non-probability sampling method becomes a necessary technique in qualitative studies as it helps the researcher to recruit specific participants whose experiences can contribute to the declared objectives of the study (Dosek, 2021).

### **3.4.3 The sample**

Cohen et al. (2018) defined the study sample as the group of individuals who voluntarily agree to participate and share their experiences of the topic under study. The selection of a study sample is an essential element in the research design as it has a direct impact on the research’s ethics, validity, and reliability as well (Bloomfield & Fisher, 2019) . Selecting a specific sample for the research depends on the research design whether it is a qualitative, quantitative or a mix of both methods. Deciding the proper research design enables the researcher to choose the relevant sampling strategy and the suitable size of the sample as well (Creswell & Creswell, 2017).

The sample of the present research consisted of twenty secondary school teachers: twelve from Egypt and eight from Scotland. In Egypt, the total number of referrals was fifteen. Twelve participants were interviewed while three referrals declined to be interviewed. The final sample consisted of three females and nine males. They were secondary school

teachers who taught different subjects; eight were English language teachers, one French language teacher, one mathematics teacher, one physics teacher, and one social studies teacher. In Scotland, I was introduced to twelve secondary school teachers. Eight participants were interviewed while four declined to be interviewed. The final sample was five females and three males. They were secondary school teachers who taught different subjects; two were science teachers, two history teachers, one business administration teacher, one drama and dancing teacher, one mathematics teacher, and one computing sciences teacher. Participants' age range was between twenty-four and fifty-six years old. Their teaching experience ranged from two to thirty-two years of teaching. They were all university graduates and hold a bachelor's degree in the subject they are teaching. Some of the participants from Scotland hold a master's degree while other were either studying a master's or a doctorate degree. Participants from Egypt generally did not hold a Post Graduate Diploma of Education (PGDE), except one teacher. On the other hand, all participants from Scotland studied a one-year Post Graduate Diploma in Education (PGDE). Regarding the availability of ICT tools in the classroom, all participants said that there were various ICT tools available in the classrooms or within the school. Participants in both contexts confirmed that they have smart / interactive boards, tablets/iPads, in the classroom while overhead projects, and television sets were available at multimedia suits in Egypt and overhead projectors were available in the classrooms in Scotland. Furthermore, teachers from Scotland have desktop computers in the classrooms while it was not available for participants in Egypt. The below table describes the demographics of participants, the qualifications they hold and the type of ICT tools they use in the classroom.

**Table 1: Participants' demographics**

### A- Egypt

Gender	Age	Subject	Teaching Experience	Qualifications	PGDE	Type of ICT in Classroom
Female	45	English (EFL)	20 years	BSc. Arts and Education	N/A	Smart Board+ Tablet
Female	40	English (EFL)	17 years	BSc. Arts and Literature	1 Year	Smart Board+ Tablet
Female	33	English (EFL)	10 years	B.A. Arts and Education	N/A	Smart Board+ Tablet
Male	52	French	30 Years	B.A. Arts and Literature	N/A	Smart Board+ Tablet
Male	52	English (EFL)	30 years	BSc. Arts and Education	N/A	Smart Board+ Tablet
Male	52	Social Studies	29 years	BSc. Arts and Education	N/A	Smart Board+ Tablet
Male	50	Mathematics	28 years	BSc. Science and Education	N/A	Smart Board+ Tablet
Male	47	Physics	27 years	BSc. Science and Education	N/A	Smart Board+ Tablet
Male	36	English (EFL)	14 years	BSc. Arts and Education	N/A	Smart Board+ Tablet
Male	56	English (EFL)	32 years	BSc. Arts and Literature	N/A	Smart Board+ Tablet
Male	52	English (EFL)	30 years	BSc. Arts and Education	N/A	Smart Board+ Tablet
Male	53	English (EFL)	29 Years	BSc. Arts and Education	N/A	Smart Board+ Tablet

### B- Scotland

Gender	Age	Subject	Teaching Experience	Qualifications	PGDE	Type of ICT in Classroom
Female	50	Computing Sciences	02 years	MSc. IT	1 Year	Smart Board+ PC
Female	26	Drama and Dance	04 years	Master of Arts- Theatre	1 Year	Smart Board+ iPad
Female	24	Mathematics	02 years	M Math (Hons)	1 Year	Smart Board+ iPad
Female	27	History & Modern Studies	05 years	MA (Hons) History & Sociology	1 Year	Smart Board+ iPad
Female	25	Chemistry and Science	04 years	BSc. Chemistry	1 Year	Smart Board+ iPad
Male	35	History & Legal Studies	10 years	MA History & Law	1 Year	Smart Board+ Chromebook
Male	28	Biology	03 years	BSc. Science	1 Year	Smart Board+ Chromebook
Male	27	Business Administration	05 years	BA (Hons) Business	1 Year	Smart Board+ iPad

### **3.5 Data Collection method**

There are different methods of data collection that researchers can employ in qualitative studies. These can be document analysis, surveys, focus groups, case studies, field observations, or interviews (Busetto et al., 2020; Stenfors et al., 2020). However, interviews are the widely used method of data collection in in the different fields of qualitative studies. Interviews can be conducted by face-to-face, on telephone, by post, and through internet communication tools such as skype or messenger (Thunberg & Arnell, 2022). Interviews can also come in the form of focus group where the interviewer discusses the phenomena with a selected group of interest then take notes of their responses and record these discussions by audio or video methods (Sim & Waterfield, 2019).

Interviews are usually designed into three types: structured, unstructured, and semi-structured. Structured interviews, also known as questionnaires, are designed with specific pre-planned set of a closed- format questions (Alam, 2021). The interviewer offers each participant the same set of questions and participants have limited choices of answers. Researchers who use this type of interviews usually insert one or few open-ended questions at the end of the questionnaire. These questions provide interviewees the opportunity to express their views and provide further information they may hold about the topic of the study (Stenfors et al., 2020). The second type of interviews is the unstructured or in-depth interviews. Researchers employ this type of interviews usually submit a question about a specific phenomenon. This question helps them to conduct a discussion with the participants to define the variables that require in-depth exploration (Ruslin et al., 2022). It is a type of interview that has no predetermined set of questions or answers; the interviewer submits a leading question then forms the successive questions based on the diverse responses of the

participants' (Morse, 2020). It is a type of storytelling where the interviewer becomes a listener and let the interviewees tell his/her life story. Winwood (2019) said that this is "the natural development of conversation and the insights revealed is one benefit of doing unstructured interviews" (p.14). Thus, each interview is different, and the researcher cannot conceive specific expectations out of it as different sets of successive questions generate due to every participant's unique response. The third type of interviews is the semi-structured interviews which I have employed in the present study to collect the data. In the coming sections, I will discuss the characteristics of this method and provide a justification for the preference of this method in favour of other data collection methods.

### **3.5.1 Semi- structured interviews**

Cohen et al. (2018) defines a semi-structured interview as "a flexible tool for data collection, enabling multi-sensory channels to be used: verbal, non-verbal, spoken and heard" (p.506). Researchers employ this method to conduct an in-depth investigation of the study phenomenon. This technique enables interviewees to express their thoughts and helps the researcher to gain in-depth insights into the interviewees' experiences of the phenomenon under study (Roberts, 2020). Brinkmann (2020) defines semi-structured interviews as a form of a two-way conversation where the interviewee shares ideas and thoughts that are not directly being scrutinised, but which add context and generate valuable data for the researcher. He considered this type of interviews a question-based conversations that "are normally seeking descriptions of how interviewees experience the world, its episodes and events, rather than speculations about why they have certain experiences." (p.437).

There are several benefits of using semi-structured interviews to collect data within qualitative research, and I will discuss some of the most relevant benefits for my research in this section. Flexibility is one of the essential strengths of the semi-structured interviews as

they blend the rigidity of structured interviews and the flexibility of unstructured interviews. This flexibility generates a type of a tailored design that provides each participant a separate space to express his/her personal perspectives about the phenomenon under study and the experiences he/she has accumulated about it. The conversational design of the semi-structured interviews also provides the researcher an opportunity to build a rapport with the interviewees and gain their trust. This conversational design makes interviewees feel comfortable and able to share their experiences and provide honest responses in relation to the phenomenon under study. This, in return, produces a thick description of the phenomenon and enhances the quality of data as well (Husband, 2020). This design also enables the researcher to provide participants with emotional support to reduce the distress they may feel during the interview. Furthermore, participants in semi-structured interviews feel they have more control over the course of the interview (Ruslin et al., 2022). They are able to discuss various issues relevant to the study topic (Drabble et al., 2016).

Semi-structured interviews can be a useful method in investigating cross-cultural issues in different contexts as it enables the researcher to design the interview in a way that suits the social and cultural norms of each context. In the present research, the social and cultural norms of participants define their perceptions of the cultural shift toward more student-centred educational paradigms that are necessary for the successful integration of ICT in their pedagogical practices. The adaptability of this design made it significant to the present research. For instance, I formed the questions to revolve around participants' perceptions of the complexity of ICT integration and the relevant factors that affect its success. Furthermore, it enabled me to customise the communication styles to consider the cultural differences between participants. Researchers who employ semi-structured interviews also set a number of guiding questions that are used in every interview however, the order of these questions is decided on the spot and dependent on the flow of the

conversation (Thompson Burdine et al., 2021). These guiding questions enable the researcher to gain an in-depth understanding of the participants' perspectives about the study phenomenon and their experiences of it. I employed the guiding questions in the present research to encourage participants to elaborate on their responses and provide in-depth details about their thoughts and ideas of the phenomenon under study. This, in return, has provided comprehensive and in-depth knowledge of the study topic and has enriched the results and conclusions as well.

By way of contrast, researchers who employ surveys and questionnaires aim to generate statistical data that do not describe the complex experiences of participants. This method limits participants' responses to specific scales and restricts the researcher's ability to follow on specific issues and obtain more in-depth insights to enrich the data. It also limits participants' ability to provide in-depth exploration of their experiences and interpretation of the phenomenon under study. Focus groups provides another type of data collection in qualitative research (Pinto da Costa, 2021). Researchers employ this method to understand the collective experiences of a specific group of the phenomenon under study. However, this one of the pitfalls of this method is the potential of generating a "groupthink". This notion emerges from data when specific members of the group dominate the narrative of the whole group and do not allow other participants to express their individual experiences (Sim & Waterfield, 2019). The below table describes the type of contact medium I used to contact the participants and the length of each interview.

**Table 2: Medium of Contact and length of the interviews**

**A- Egypt**

Participant	Gender	Medium of Contact	Length of interview
1 <sup>st</sup> Participant	Female	Facebook Messenger	95 Minutes
2 <sup>nd</sup> Participant	Female	Facebook Messenger	108 Mints (1 <sup>st</sup> ), 45 Mints (2 <sup>nd</sup> )
3 <sup>rd</sup> Participant	Female	Facebook Messenger	64 Minutes
4 <sup>th</sup> Participant	Male	Facebook Messenger	89 Minutes

5 <sup>th</sup> Participant	Male	Facebook Messenger	51 Minutes
6 <sup>th</sup> Participant	Male	Facebook Messenger	100 Minutes
7 <sup>th</sup> Participant	Male	Facebook Messenger	73 Minutes
8 <sup>th</sup> Participant	Male	Facebook Messenger	54 Minutes
9 <sup>th</sup> Participant	Male	Facebook Messenger	85 Minutes
10 <sup>th</sup> Participant	Male	Facebook Messenger	76 Minutes
11 <sup>th</sup> Participant	Male	Facebook Messenger	64 Minutes
12 <sup>th</sup> Participant	Male	Facebook Messenger	71 mints (1 <sup>st</sup> ), 35 Mints (2 <sup>nd</sup> )

#### **B- Scotland**

Participant	Gender	Medium of Contact	Length of the interviews
1 <sup>st</sup> Participant	Female	Telephone call	52 minutes
2 <sup>nd</sup> Participant	Female	Telephone call	88 minutes
3 <sup>rd</sup> Participant	Female	Telephone call	73 minutes
4 <sup>th</sup> Participant	Female	Telephone call	69 minutes
5 <sup>th</sup> Participant	Female	Telephone call	55 minutes
6 <sup>th</sup> Participant	Male	Telephone call	42 minutes
7 <sup>th</sup> Participant	Male	Telephone call	65 minutes
8 <sup>th</sup> Participant	Male	Telephone call	51 minutes

### **3.5.2 Designing the data collection instrument.**

Cohen et al. (2018) suggested that the initial phase of designing an interview should address the below aspects:

- the theoretical basis of the study,
- The broad aims of the study
- The practical value of the study
- the reasons why the interview approach was chosen. (p.512)

These aspects should help the researcher designing a flexible and attractive data collection tool. This tool should motivate participants to express their experiences comfortably and enable the researcher to form their perspectives of the phenomenon under study into a holistic picture (Sekaran & Bougie, 2020). Nowell and Albrecht, (2019) argued that the more the interview questions are clear and concise, the better the results the research will provide.



Cohen et al. (2018) also confirmed that when questions are well designed, they help the researcher move upward and downward the set of questions to motivate participants and avoid sensitive issues as well.

During the stage of designing the interview questions, I considered the previously mentioned aspects. I, firstly, arranged the questions in a logical and sequential structure to form a spontaneous dialogue between myself and the participants to reflect the study goals. During the interviews, I formed further questions (i.e., prompts and probes) to encourage participants to provide genuine responses and elaborate to provide further details. I also used these prompts and probes as a path to clarify to participants any unclear questions. Another important aspect that I considered when designing the data collection instrument was the wording of the interview questions. Wording is one of the important aspects a researcher should consider when designing the interviews (Lester et al., 2020; Foley et al., 2021). It is about the selection of simple and clear words for each question. These words should be arranged in a logical order and flow in a sequence that enables participants to understand the purpose of each question. This technique enables the researcher to obtain meaningful responses that enrich the data and the study findings as well (Morgan, 2022). Therefore, to make interviews a successful experience for the participants and myself and to produce valuable data, I endeavoured to use neutral language while wording the questions. I dropped out any ambiguous words that participants may not understand, or they may consider as leading questions that aim to produce specific responses. Furthermore, I excluded words that can be related to participant's sensitive issue such as, age, race, colour, sexual orientation, and religious believes as well.

### **3.5.3 The interview guide structure**

To conduct a qualitative study, researcher should devise an interview guide which is a list of questions and topics that can be used by the researcher in each interview. This list of questions guides the conversation to obtain answers that explore participants' experiences of the phenomenon under study and how they have formed their perspectives about it. Thus, I designed the interview guide of the current study upon extensive review of literature (see for example: Mishra, & Alok, 2022; Roberts, 2020; Easterby-Smith, 2021; DeJonckheere & Vaughn, 2019). Those scholars suggested several models that researchers can employ to design the interview guide. They suggested that an interview guide should have at least three main parts: 1) introduction or opening 2) body, and 3) closing. They contended that each part is designed to achieve a specific purpose for each stage of the interview and the progress of the conversation. They also noted that researchers should phrase questions in a simple and neutral language to avoid jargons and questions that are not related to the study topic. In other words, researcher should not perceive interview guide as a rigid format. It is the researcher's responsibility to design the structure of the interview clearly to serve the purpose of the interview and to elicit in-depth and rich data. I included the question guide to the research proposal and submitted to the Ethics Committee of the school of education for approval. Once I received the approval, I conducted a pilot study to pre-test the data collection instrument before conducting the main interviews with the study participants. Moser & Korstjens (2018) said that "Working with an interview guide or questioning route enables you to collect information on specific topics from all participants. You are in control in the sense that you give direction to the interview, while the participants are in control of their answers." (p.13). I followed these guidelines when I designed the interview guide for the present study. Questions were sequenced as introduction, body, and closing. My doctoral supervisors reviewed the first draft and provided their insights and amendments about the

structure and wordings of some questions. I discussed further questions with my doctoral supervisors, and we finally agreed upon these amendments to cover more aspects of the study. Regarding labelling of the questions in each part, I adopted DeJonckheere and Vaughn's model (2019) of questions and prompts sequencing. The final shape of the interview guide is available in the appendices.

### **3.5.4 The Pilot Study**

The pilot study or pre-testing is a process that enables researchers to obtain an authentic experience of how participants perceive the phenomenon under study (Abd Gani et al., 2020). It enables the researcher to collect preliminary data, assess the competence of the data collection instrument, and discover any potential deficiencies in it as well (Yeong et al., 2018). Piloting also enables the researcher to examine the relevance of the interview questions and how they could encourage the study participants to provide in-depth information about the phenomenon under study. Furthermore, it helps the researcher to evaluate the wording and structure of the questions and define how easy or difficult they are for the participants to understand (Ismail et al., 2018). Williams-McBean (2019) defined pilot study as “small-scale studies that precedes larger studies and helps the researcher to make improvements to the larger study” (p.1055). This technique also helps researchers developing an empirical perspective of the phenomenon under study and to rectify any shortcomings that may appear or, in some cases, restructure the main study profoundly (Richards & Hemphill, 2018). Furthermore, researchers tend to conduct pilot studies to obtain preliminary data that support their study proposal if they are seeking institutional or external financial funds (Billups, 2020). I conducted three piloting interviews in Egypt in addition to one piloting interview in Scotland as well. Participants of the piloting studies have teaching experience that ranged between ten to thirty-one years. Participants of piloting studies in Egypt hold a bachelor's degree in education, however unlike their counterpart from Scotland, none of them

hold a Post Graduate Diploma of Education (PGDE). All participants confirmed that they have access to ICT tools such as smart boards, interactive screens, and portable tablets in the classroom. They also confirmed that they utilise these tools in their teaching practices. The below table shows the length and medium of interviews I have conducted with each participant.

**Table 3: Demographics of the pilot study participants.**

**A- Egypt**

Gender	Age	Subject	Teaching Experience	Qualifications	PGDE	Type of ICT in Classroom
Male	37	English (EFL)	14 years	BSc. Specific Education	N/A	Smart Board+ Tablet
Male	53	English (EFL)	31 years	BSc. Arts and Education	N/A	Smart Board+ Tablet
Male	51	English (EFL)	29 years	BSc. Arts and Education	N/A	Smart Board+ Tablet

**B- Scotland**

Gender	Age	Subject	Teaching Experience	Qualifications	PGDE	Type of ICT in Classroom
Female	50	English	10	MA English	1 Year	Smart Board+ PC

**Table 4: Medium of contact and the length of interviews**

**A- Egypt**

Participant	Gender	Medium of Contact	Length of the interviews
1 <sup>st</sup> participant	Male	Facebook Messenger	156 Minutes
2 <sup>nd</sup> Participant	Male	Facebook Messenger	52 Minutes
3 <sup>rd</sup> Participant	Male	Facebook Messenger	61 Minutes

**B- Scotland**

Participant	Gender	Medium of Contact	Length of the interviews
1 <sup>st</sup> participant	Female	Telephone call	60 Minutes

### **3.6 Research Ethics**

Ethics ensure that the research was carried out in accordance with observed standards of practice. They also ensure that participation was voluntarily and confirms that the researcher would consider the measures that protect the confidentiality and /or anonymity of participants. The research ethics process requires the researcher to submit an ethics application to either the University or Departmental Ethics Committee for review and approval- often with amendments. Once the application is reviewed and approved, the researcher abides by the rules and limitations set out in the ethics application and ensures the anonymity and/or confidentiality of the participants as well as seeking their consent to participate in the research.

#### **3.6.1 Approval of the Ethics Committee**

According to Brown et al. (2020) an ethics committee has several obligations such as "... ensuring the rights of participants are protected, fostering academic integrity within and beyond their institutions and a responsibility to the wider society which may be affected by the research results as well as to the researcher themselves." (pp. 748-749). An ethics committee has an essential role in ensuring that the researcher will carry out the measurements imposed by the educational organisations of ethics with high standards when he/she conducts the research (Brown et al., 2020). This practice is essential to protect participants' rights as being the research subjects and to guarantee that the researcher will conduct quality designed and safe research. In November 2019, I submitted my ethics application to gain the approval from the School of Education's Ethics Committee. The committee returned the application in January 2020 with feedback and minor corrections. After that, I returned the amended application to the committee and received the committee's full approval in February 2020 to start collecting the data. The ethics application included a detailed consideration of the different elements I had in place to protect the confidentiality

and anonymity of the participants. I provided samples of the documents I will provide to the potential referrals to ensure that their participation is entirely voluntary, and that they have appropriate information about the nature of the study, the type of sampling method, and the type of data collection method I intend to employ. A copy of the ethics committee's approval is provided in the appendices.

As the research took place during the COVID-19 pandemic and teachers were not observed in their classrooms but asked about their pedagogical practices, permission from headteachers and the Ministry of Education was not sought. An informed Consent Letter and the Participation Information Sheet (PIS) were sent to each participant before conducting the interviews. These two documents provided participants with information about the aims of research, the expected time of the interview, the voluntary nature of their participation, and their right to withdraw, if they so wished. The Ethics Committee approved face-to face interviews as the research's data collection method. However, due to the COVID-19 pandemic and an inability to travel overseas, I conducted the interviews remotely to ensure my own safety and that of the participants. This option was approved by the doctoral supervision team.

### **3.6.2 Informed Consent and Participants' Information Sheet**

These two documents are essential in conducting research in all disciplines as they make the ethical process explicit and clear to participants and the audience. Once I received the approval from the Ethics Committee, I sent both documents to each participant to help them form a preliminary perspective about the research project they are invited to participate in. The principle of Informed Consent confirms "participants' right to freedom and self-determination." (Cohen et al., 2018, p. 122). It informs participants that their participation is voluntary, and they are free to accept or refuse to participate in a particular research project.

In this letter I sent to participants, I provided information that allowed them to assess the potential hazards and understand the advantages of their participation in the research. The document also included the contact details of the chief investigator and the Ethics Committee reader to whom participants can address their concerns, if any. Furthermore, I confirmed to participants that they have the right to withdraw their consent at any time before, during, or even after the interviews were conducted without any reason.

The participants' Information sheet (PIS) provides participants with information about the nature of the study, their role in the study, why they have been selected for participation, and the significance of the study and its implications. The PIS also provides participants with information that allows them to assess the potential hazards and understand the advantages of their participation in the research. PIS was provided to participants from Scotland in English while I provided an Arabic translation to participants in Egypt as this is their native language. I conducted the translation of both documents myself as this is my native language. However, checking of the translation was conducted by a third party (also an Arabic speaker) to confirm accuracy of translation.

### **3.6.3 Participants' confidentiality**

In the present research, interviews were conducted remotely over the telephone and the internet. I maintained strict measures of confidentiality and anonymity to protect participants' identities. I used pseudonyms for all participants and edited any identifying information from transcripts prior to sharing them with other parties for analysis, proof reading, peer-reviewing, or reproduced in publications and related outcomes. In addition, I kept the data in a secured online file with a highly secured password.

### **3.6.4 Minimizing Risks**

The present study is not an experimental study. It did not intend to elicit painful or traumatic memories. There is not predictable disadvantage, or potential harm that could arise

during the course of this research. I ensured that interviews were conducted in a safe, secure, and economic way. Prior to the interview, I contacted each interviewee to set out suitable time and date for the interview that suits him/her and do not contradict with his/her business or family commitments. At the beginning of every interview, I sought to affirm each interviewee's willingness to participate and provided guidance on accessing well-being services should they have been required. Before recording of the interview, I had a short conversation with each participant to build a rapport with them and to clarify any issues that may have been of concern to them. I conducted the interviews in a quiet and separate room in my house away from family members. Long interviews can make participants feel bored or even distressed. On one occasion with one of the interviewees from Egypt the interview was interrupted due to family commitments. On that occasion, I stopped the interview immediately and gave the interviewee a break to resolve the family issue before returning to the interview later.

### **3.6.5 Avoidance of Coercion**

In the present study, my position as an outsider in both contexts (i.e., Egypt and Scotland) was an advantage. Participants were not implicitly or explicitly coerced to participate in this research as I did not have any institutional power to force them to participate, threat them of any type of penalties if they decided to opt out of the study or provide them with incentives to influence their participation. I avoided excessive demands on participants during interviews to minimise and manage emotional distress or discomfort that could arise. I also endeavoured to take into consideration any potential gender issues that could arise during the interviews. Sensitive structural inequalities associated with race, gender, socioeconomic status, and sexual orientation were considered.



### **3.7 Conducting interviews**

Interviews were conducted on the telephone with participants from Scotland while the online Facebook messenger platform was the mean of communication with participants from Egypt. The original plan was to collect the data through face-to-face interviews in both contexts; however, this plan has been changed due to the Covid-19 pandemic. The decision to conduct interviews remotely was taken to ensure the safety of participants and researcher as well. Conducting interviews remotely either on the telephone, by post, or by online methods to collect qualitative data has been considered inferior to the traditional face-to-face interviewing method (Johnson et al., 2021). Proponents of face-to-face interviews considered this method more effective than remote interviewing (see for example, Moser & Korstjens, 2018; Davies et al., 2020; Schober, 2018). They contended that the remote interviewing methods lack the characteristics of the face-to face method and, therefore, the results emerged might be biased or lack validity. They said that employing face-to-face interviews enables the researcher to build and maintain rapport with interviewees and encourage them for spontaneous and honest discussion of the phenomenon under study. They further contended that visual contact between interviewer and the interviewees facilitates communication and provides comfortable and friendly atmosphere. However, proponents of remote interviewing argued that there is not considerable evidence that supports superiority of face-to face interviews to remote methods of interviewing (see for example: Drabble et al., 2016; Johnson et al., 2021; Saarijärvi & Bratt, 2021; Azad et al., 2021). They confirmed that the quality of data collected through remote interviewing has the same quality of the face-to- face interviews. They confirmed that though remote interviewing methods lack visual cues, but this does not affect the data or might distort its quality. They further contended that remote

interviewing could help participants revealing sensitive information spontaneously while they may not do this during face-to-face interviews.

I do agree with proponents of the face-to-face method that observation of interviewees' physical gestures during interviews is one of the characteristics that distinguishes face-to face interviews as a data collection method. These characteristics enable the researcher to interpret these observations into meaningful data. According to Cohen et al. (2018) the verbal cues, the pauses and utterances of the body language are "... enabling multi-sensory channels to be used" that resemble the "verbal, non-verbal, spoken and heard" words of the interviewees. (p.506). The latter part of the quote expresses the dilemma I have been into. It was a challenging task for me to conduct interviews remotely particularly in the absence of the face-to-face element. Due to the pandemic restrictions, I was only able to make use of the spoken and heard sensory channel. This issue made me wonder if I would be able to gain participants' confidence and build a rapport with them while interviewing them remotely. Therefore, in the absence of these features and to encourage participants to talk spontaneously in the interviews, I tried the best I can to help them accept the idea of *the masked researcher* or *the voice*. I employed the Ice-breakers technique to build a rapport with each participant. This is an established method that helps crossing over barriers between interviewer and interviewees to gain their trust and confidence before starting the interview.

Gibson et al. (2024) said:

*"Icebreakers serve a number of functions: they help participants to feel relaxed and comfortable before starting data collection; they give everyone a chance to practise saying something in the group; they help the participants and facilitators to get to know each other; and they also help to establish an environment in which sharing, and listening are valued" (p.124).*

To employ this technique efficiently, I started each interview with a brief discussion about their well-being and how they were able to balance between their teaching duties and personal or family commitments during the pandemic restrictions. I was always cautious and avoided asking specific personal details so that participants may feel that their personal life was breached. These short introductory discussions helped me to initiate rapport with each participant. This technique is supported by the aforementioned studies and further studies that have investigated the researcher's ability to build rapport with interviewees and provide them with comfortable atmosphere to gather contextual data while interviewing them remotely (See for example: Aspers & Corte, 2019; Aurini et al., 2021; Belotto, 2018; Self, 2021; Azad et al., 2021). These studies argued that their interviewees felt comfort while being interviewed remotely. They contended that this method has enabled them to protect interviewees' privacy and anonymity. Furthermore, they said that the absence of the visual traits eliminated the bias that could occur at the physical presence of the interviewer. This, in return, have offered interviewees more freedom to talk openly and, also, enabled the researchers to build rapport with them similar to face-to-face interviews.

### **3.7.1 COVID-19 Restrictions**

In Egypt, the *tablet project* was recently implemented at secondary schools and pupils at grades 10, 11 and 12 were handed these tablets to take monthly and final exams electronically. The pandemic has forced educational authorities in Egypt to close schools in March 2020 to avoid the spread of this contagious virus. Uncertainty was dominant over the whole country and secondary school teachers were not an exception. Teachers were not sure how they will deliver the curriculum after the closure of schools. Parents were concerned how their children will perform the mid-year and end-of-the year exams particularly those at grade12 which is the secondary school certificate- Thanawiya A'ammah. By the end of March 2020, Minister of Education announced that the 2019- 2020 school year for grade 10

and 11 has ended and pupils are not required to take any kind of final exams. Instead, pupils should submit a mini research project/article as an alternative evaluation tool to measure the amount of knowledge they have accumulated. Pupils were given three months to submit either an electronic or printed version of the mini research project/article . The MoETE also launched the *Edmodo* online platform as a learning channel for grade 12 pupils and appointed a number of teachers to deliver lessons online. This was a chance for pupils to study the remaining parts of the curriculum before they take the end-of-the year exams. However, there were different issues that hindered secondary school teachers to use this platform for teaching. First, teachers could not deliver lessons from home but had to go to schools to deliver them though schools were closed due to the pandemic restrictions. This issue was not safe and could have led to further spread of the COVID-19 virus. Furthermore, pre-university teachers in Egypt, in general, and secondary school teachers, in particular, did not practice online teaching before and did not receive proper training to on the use of this new method of teaching.

In Scotland lockdown restrictions were imposed on most activities except for key workers and essential services places. Schools and nurseries were closed in March 2020 till further notice; an incident that has never happened in the recent history of Scotland and the UK schools except during the 2<sup>nd</sup> World War after evacuating schools in fear of air-raids. The idea of closing schools and delivering teaching online was mandatory to protect pupils, teachers, and other staff from being infected and to control the spread of the virus. This was unprecedented experience for teachers, pupils, and parents or caregivers. Teachers had to deliver all their teaching online from home to make sure that pupils are on the track and can follow their coursework without interruption. It was a new experience for teachers across primary and secondary schools to teach their coursework online entirely. Furthermore, pupils did not sit for final exams for the first time in the country's modern history. Instead, an

evaluation formula was constructed to grade them. This formula was based on the coursework they have already completed, and teachers' assessment of pupils' recent and earlier attainment last year and the year before; a compound formula that formed an extra burden for teachers in addition to their family commitments and frustration they have encountered due to this pandemic. Due to these restrictions, I was not able travel to Egypt to meet the interviewees and conduct face-to-face the interviews with them. Following a discussion with my doctoral supervisors, it was agreed that I should conduct interviews via Facebook messenger with participants from Egypt and to interview participants from Scotland over the telephone or any other convenient online mean of communication.

### **3.8 Data checking and analysis**

I employed Braun and Clarke's thematic analysis (TA) model to analyse data and generate the relevant themes. Braun and Clarke (2006) described TA as "a flexible and useful research tool, which can potentially provide a rich and detailed, yet complex account of data" (p.78). TA is a systematic and flexible model that helps qualitative researchers accessing the rich details of the data, identifying the initial codes, and grouping these codes into final codes to form the themes and answer the research question(s) (Lochmiller, 2021). TA can be employed as an inductive approach to develop themes from within the raw data or using existing theoretical frameworks to guide the data analysis deductively (Castleberry & Nolen, 2018). Braun and Clarke (2006) designed the TA model into six-phases to enable researchers exploring the raw data in a flexible and structured fashion. It is a gradual process that enables the researcher to familiarise him/herself with the data and generate the initial codes (Vaismoradi & Snelgrove, 2019). Researchers employ the TA model start searching for themes and reviewing these themes before defining and naming them to produce the final report. This flexible and accessible structure of the TA model have made it one of the widely employed models in qualitative research compared to other models such as Grounded

Theory, Interpretative Phenomenological Analysis (IPA) and Narrative Analysis (Cuthbertson et al., 2020).

Grounded Theory (GT) is one of the dominant approaches in qualitative research. The core of this approach relies on theoretical saturation of data to generate new theory (Charmaz, K & Thornberg, 2021). Researchers employ this approach to conduct an extensive iterative process of constant comparison of data and theoretical sampling to develop a new theory (Birks et al., 2019). Though GT is one of the powerful approaches to generate a new theory, it is a complex and a time-consuming approach that requires constant engagement with the data over long periods of time (Urcia, 2021). The second popular approach of data analysis in qualitative studies is Interpretative Phenomenological Analysis (IPA) (Nizza et al., 2021). Researchers employ this approach to conduct in-depth investigation of individuals' personal experiences of a particular phenomenon. Researchers who employ this model usually recruit a small sample of participants and consider each participant a separate case who is able to form distinctive meanings of the phenomenon (Rajasinghe, 2020). Narrative Analysis is the third model researchers employ in qualitative data analysis. It is an attentive model that focuses on understanding individuals' different ways in constructing their narratives about their life experiences (Wong & Breheny, 2018). It provides researchers an explicit perception of how individuals construct their life stories and the meanings they have developed about the social reality. It focuses on investigating the narration of each individual rather than identifying broader themes within the narratives of all participants (Bengtsson & Andersen, 2020).

Aside from the aforementioned approaches, the TA model is characterised as a practical data analysis tool that can be applied to investigate complex data in a flexible fashion. The straightforward and flexible six-phase structure of the TA model makes it an easy-to-use tool for both novice and expert researchers. This flexibility enables the

researchers to adapt the TA model into different theoretical frameworks. It also enables them to form their perspectives of the social reality in diverse ways. The below table presents the six- phases of the Braun and Clarke's TA model.

Table (5) Braun and Clarke's (2006) Thematic Analysis Model, (p.87)

Phase	Examples of procedure for each step
1 Familiarising yourself with your data	Transcribing data (if necessary), reading and re-reading the data, noting down initial ideas.
2 Generating initial codes	Coding interesting features of the data in a systematic fashion across the entire data set, collating data relevant to each code.
3 Searching for themes	Collating codes into potential themes, gathering all data relevant to each potential theme.
4 Reviewing themes	Checking if the themes work in relation to the coded extracts (Level 1) and the entire data set (Level 2), generating a thematic 'map' of the analysis.
5 Defining and naming themes	Ongoing analysis to refine the information of each theme, and the overall story that the analysis tells, and generating clear definitions and names for each theme.
6 Producing the report	The final shape of the analysis. Selection of vivid data, compelling extract examples, final analysis of selected extracts, relating the

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analysis to the research question and literature, and producing a scholarly report of the analysis.

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### **3.8.1 Phase 1: Familiarisation with the data**

This phase focuses on listening to the audio tracks of each interview and take notes about the repetitive patterns before starting to transcribe the interviews. These notes help the researcher to extract meanings and recognise the repeated patterns that he/she can form initial codes from them. Transcribing interviews relates to the conversion of verbal and emotional reactions into a written form (Bennett et al., 2019). It refers to the transformation of participants' verbal expressions and the specific words or idioms they use in their language into meaningful and textual data. There are two main types of transcription: verbatim and selective. Verbatim is a literal transcription of participants' words, utterances, and sounds (McMullin, 2023). It is mostly employed in discourse analysis that requires a detailed transcription of the conversation to serve the aims of the research (Eppich et al., 2019). Selective transcription, on the other hand, summarises the relevant content that can produce meaningful data. This technique is normally employed in thematic analysis (Nascimento & Steinbruch, 2019). Selective here does not mean omitting or neglecting major chunks of participants' words, but to select specific content to produce themes. The accuracy of transcription can positively or negatively affect the quality of data interpretation and analysis. The more accurate the transcripts, the less bias it can produce and the better it maintains the validity of findings (Bird, 2020). Conducting the whole transcription process by myself was exhausting but useful in gathering the different particles of data into one whole picture that describes participants' experiences of the study phenomenon. I conducted interviews with participants in both contexts of the study in their native language: Arabic in Egypt and



English in Scotland. After that, I carried out a thorough translation of Arabic transcripts to English. This dual practice is essential in qualitative research and has a significant effect on the depth of data and the research's validity as well. Furthermore, I asked a third party who is a critical friend of mine to check the accuracy of translation. Translating Arabic transcripts into English allowed me to showcase my findings and build a consensus between teachers in Egypt and Scotland. I took the highest measurements to ensure that I clarified any ambiguous colloquial idioms and expressions used in Arabic and English to avoid misinterpretation during data analysis. Finally, I re-read every transcript against its original audio recording to make each one reflected in participants' words.

Conducting cross-culture research raises the issue of cultural differences between the study contexts. These cultural differences exist in contexts who speak different languages and raise the need for translation to avoid biases that may exist (Pinto da Costa, 2021).

Translation here is the medium of communication that the researcher employs to help the supervising team of the research and the potential audience understanding the experiences of participants who speak different languages (Abfalter et al., 2021). Furthermore, translating the interview transcripts is essential if some of these interviews were conducted in a language that is different than the language of the research or publication (McMullin, 2023).

Translation strengthens the research validity and makes it relevant to the targeted audience (Squires et al., 2020). The explanatory nature of translation requires accurate conversion of words or phrases from one language to another to avoid misinterpretation of the meaning. It is concerned with balancing the accurate conversion of words or phrases into their appropriate equivalents in another language without distorting the original meaning that could lead to a misunderstanding of the cultural norms at one or all of the study contexts (Esfehani & Walters, 2018). Therefore, researchers should consider cultural differences and take cautious measurements to avoid bias and affects the research validity.

### **3.8.2 Phase 2: Generating initial codes**

This phase has been a labouring intensive and a complex phase. It required lots of efforts in addition to long working hours. Coding process was conducted in a manual fashion. Though I have consumed a lot of time and effort in this phase, it has helped me to understand participants' experiences of the phenomenon under study and how they have formed their perspectives about it. Though using computer-assisted programmes such as NVivo for coding is widely employed in qualitative research as it helps the researcher to sort, organise, and recall the data in an easy and quick fashion. However, it does not express human feelings as manual coding can do. In this phase, I re-read each transcript thoroughly, word by word and line by line to recognise, collect, and sort the repeated words, phrases, and sentences that can lead to the generation of the initial codes. Then, I refined these codes by either discarding the overlapped codes or merging them into one code to generate a group of refined codes that could be grouped into meaningful themes. The refined codes were labelled and sorted according to their relevance to the research questions. The progress in this phase has resulted in the emergence of some of the potential themes.

### **3.8.3 Phase 3: Searching for the themes**

In this phase, codes were collated into potential themes. The focus of the phase was to find out patterns from inside the codes to form a correlation between them and extract the potential themes. In this phase, I started to analyse the codes that emerged from the earlier phase by organising each set of codes that could form potential themes. This is the process of thematic mapping where I drew a wider map of the potential themes then started to sort them and interwoven them under specific themes. To achieve this, I tabulated, labelled, regrouped the codes then wrote a brief description of each group to distinguish them under a specific

potential theme. This process has resulted in the emergence of a group of the main themes and the sub-themes as well.

#### **3.8.4 Phase 4: Reviewing themes**

This was the phase of evaluating the potential themes I have identified in the previous phase and to check how they were related with the extracted codes of the first phase and the thematic map that have been generated in phase two. This phase focused on the coherence of data within the themes. It was mainly about reviewing and refining the themes and the sub-themes to, possibly, form the final themes. In the reviewing process, I went through the coded data extracts, re-read them thoroughly to make sure they cohere enough to form a theme or a sub-theme. I considered those refined themes, who seemed to me they fit in the scope of the study, while other problematic themes were discarded. I discussed the identified themes and the sub-themes with my doctoral supervisors and agreed upon a preliminary shape of how themes should be.

#### **3.8.5 Phase 5: Defining and naming themes**

In this phase, the researcher defines the final themes and naming them as well. Braun and Clarke (2006) defined this phase as “identifying the ‘essence’ of what each theme is about (as well as the themes overall) and determining what aspect of the data each theme captures” (p.92). After extensive discussion with my doctoral supervisors, I identified one overarching theme as an umbrella to three main themes and a group of subthemes under each one. These themes will be discussed in detail in the next chapter.

#### **3.8.6 Phase 6: Producing the report**

This is the final stage of data analysis. In this phase, the researcher forms the data analysis in the form of a detailed report or a story to present it to the audience. This report

provides the audience “a concise, coherent, logical, nonrepetitive, and interesting account of the story the data tell – within and across themes.” (ibid).

### **3.9 Research Quality**

Qualitative research is an exploratory and interpretive approach that is grounded in the constructivist paradigm (Burns et al., 2022). Researcher who carry out this kind of research conduct in-depth investigations to generate rich data that describes participants’ experiences of the world and how they construct reality. The subjective nature of reality in qualitative research requires the employment of different types of measurements to assess its quality. These measurements differ from those applied in quantitative research (Symon et al., 2018). Therefore, concepts such as validity/credibility, trustworthiness, generalisability, reflexivity, and relatability of the data are applied in qualitative inquiry to assess its quality.

#### **3.9.1 Validity/Credibility**

The concept of research validity/credibility in qualitative inquiry differs from that in quantitative research. In quantitative research, validity refers to the accuracy of the measuring instrument the researcher employs and whether it functions effectively “to draw meaningful and useful inferences from scores on the instruments” (Creswell & Creswell, 2017, p.154) In qualitative inquiry validity/ credibility is defined as “the suitability of the tools and methods employed in qualitative inquiry to confirm “the accuracy of the findings.” (ibid). This is to say that validity/credibility in qualitative research refers to the principles that a researcher endorses to form his/her decisions and justify the techniques and methods he/she employs in the research (Quintão et al., 2020). Validity/credibility provides the researcher with criteria that justifies the selection of the type and size of the sample, the sampling strategy, and the data analysis method. These criteria validate the research question and produce relevant findings and conclusions (Hayashi et al., 2019).

Conducting a qualitative or quantitative research depends on its declared objective. It can be a descriptive analysis of statistical data or an in-depth investigation of participants' experiences of a specific phenomenon (Bergin, 2018). Deciding on a specific research methodology enables the researcher to form research questions to reflect their relevance to the research methodology and the expected outcomes of the research. In the present study, I employed a qualitative methodology in order to provide detailed description of participant's experiences of ICT integration. This approach enables the researcher to understand participants' perspectives of ICT integration and its expected positive effects on their pedagogical practices and the obstacles that could hinder it. Employing this methodology depends on its ability to allow the researcher to delve deep into participants' personal experiences and obtain their understanding of ICT integration (Cypress, 2017). Qualitative methodology requires the employment of sampling methods to validate a selection of specific procedures and deciding the type and size of the sample (Thompson Burdine et al., 2021). For the present study, I employed a snowball sampling technique to enhance the validity of the present research as it entails the recruitment of secondary school teachers as participants of the study. Those teachers are considered key actors in ICT integration at secondary education as they are the end users of ICT in their pedagogical practices. Their experiences with these tools should afford insights into ICT integration at secondary education in Scotland and Egypt. Semi-structured interviews were deemed the appropriate method for the present research. The strength of this data collection method lies in its flexibility as it allows the interviewer to build a rapport with interviewees. It also enables interviewees to inform the interviewer about their experiences of the study phenomenon in detail (Husband, 2020). This flexibility also ensures that data interpretation results is grounded in the experiences of the participants and not a result of foxed questions, so the results are meaningful and credible. Furthermore, I employed thematic analysis model for data analyse. The TA model is one of

the flexible and robust data analysis approach. The systematic and flexible structure of the TA model has enabled me to identify codes and form them into themes to enhance the validity of the research (Rose & Johnson, 2020).

### **3.9.2 Trustworthiness/Reliability**

According to Cypress (2017) qualitative research is “ a journey of explanation and discovery that does not lend to stiff boundaries” (p.254). This definition contrasts with the concepts of quantitative research. Qualitative research involves subjective interpretation of participants’ experiences with a specific phenomenon in its natural context (Adler, 2022). Subjectivity could, therefore, jeopardise the quality and credibility of qualitative research findings. Thus, it is the researcher’s responsibility to take measurements to overcome this pitfall (O’Neill, 2018). One of these measurements is trustworthiness. This concept in qualitative research is equal to reliability in quantitative studies (Rose & Johnson, 2020). Research trustworthiness refers to the accuracy of findings. It is a technique that researchers employ to convince the readers that the research findings reflect the experiences of the participants in their own words. Thus, this technique strengthens the research findings and makes them recognised by the potential audience and scholars in the academic field. The researcher, therefore, should consider trustworthiness as a primary objective of the study and a criterion that he/she should continuously assess from the beginning to the final stage of the research (Stahl & King, 2020). To assess the research trustworthiness, Lincoln and Guba (1985) proposed four criteria to enhance the trustworthiness /reliability of the research data. These criteria are credibility, transferability, dependability, and confirmability. Lincoln and Guba (1985) contended that these criteria help the audience to understand the research procedures and evaluate the authenticity of its findings and conclusions.

### **3.9.2.1 Credibility**

Credibility is similar to internal validity in quantitative research. Research credibility enables the audience to judge the accuracy of the study conclusions. It determines if the research findings were authentic and an accurate interpretation of the participants' original perspectives (Kyngäs et al., 2020). The difference between internal validity in quantitative inquiry and credibility in qualitative research is that the former defines the accuracy of findings as a causative effect between two constructs while the latter requires the employment of different strategies to ensure that the results provide credible and meaningful results (Cohen et al., 2018). Credibility can be enhanced through different techniques such as prolonged engagement, persistent observation, reflexivity, and triangulation.

#### **3.9.2.1.1 Prolonged Engagement**

Prolonged engagement is one of those techniques employed by researchers to enhance the research data. Researchers tend to spend enough time in the study site or context to become familiar with the setting and context to establish rapport with the participants and gain their trust (Liao & Hitchcock, 2018). By doing this, researchers gain a thorough understanding of the phenomenon under study and provide a thorough description of the location and people. This, in return, offers the narrative account credibility and enhances the accuracy and legitimacy of findings and conclusions. As this study took place during the COVID-19 pandemic, it was not possible to visit participants at their place of work (i.e., schools) or meet them in safe and convenient site either in Scotland or Egypt. Thus, I do not have observational data that would support comments relating to infrastructure and the ways in which ICT is used in the classrooms in Egypt and Scotland. However, there is also no reason to assume that teachers' observation/experiences were any less valid because I was unable to observe them while teaching.

### **3.9.2.1.2 Persistent Observation**

Prolonged engagement with the study context enables the researcher to, persistently, observe participants' behaviour towards the phenomenon under study. This technique provides researchers an opportunity to explore in-depth details of the phenomenon under study and allows them to “identify key relevant issues”, decide what is important and what is irrelevant, and focus on the most relevant aspects (Cohen et al., 2018, p.249). Through continuous observation, researchers explore the context in which phenomena occur and minimize biases that may exist into the data (Wood et al., 2020).

In the present research, I planned to conduct prolonged engagement and persistent observation after I received the ethical approve from the ethics committee. However, as noted above, the COVID-19 pandemic has imposed several barriers to conduct many activities that are essential for the research. The pandemic has imposed safety and logistic restrictions which have hindered these activities. Travelling to Egypt during the pandemic was problematic due to the complicated travel restrictions, the high cost of travel, and the lockdown restrictions on schools and universities for safety concerns. In Scotland the situation was not different. Schools were closed and lockdown restrictions were very strict. Thus, there was not any chance to visit participants in their place of work (i.e., schools) in both contexts to conduct face-to-face interviews and spend time observing them to understand how they utilise ICT in their pedagogical activities in the classroom. However, I have been involved in different research projects during my master's degree from 2014 to 2016. These projects focused on how teachers utilise ICT to provide pupils with better teaching practices. Furthermore, since I started my PhD in 2019 in Scotland, I immersed myself into the education system of Scotland not only through reading but also through various discussion with fellow researchers within the university before the lockdown then



online during lockdown. These discussions provided me a detailed picture about initial teacher education and how teachers form their knowledge about the significant role of ICT in education and the daily practices of utilising ICT in classrooms. In addition, being familiar with the education system in Egypt and the different stages of implementing ICT into secondary education. Furthermore, I have several discussions about ICT integration at secondary with different secondary school teachers before conducting this research and this has enabled me to form a holistic picture that formed solid basis for this study.

#### **3.9.2.1.3 Reflexivity**

Reflexivity is an analytical approach through which the researcher focuses on the structure of knowledge and reflects on his/her thoughts and ideas during the various stages of the research process to produce valuable and balanced analysis of the data. Tracy (2019) contended that reflexivity “ refers to the careful consideration of the ways in which researchers’ past experiences, points of view, and roles impact these same researchers’ interactions with, and interpretations of, the research scene” (p.2). This means that reflexivity is a key component of qualitative research approaches. It emphasises the necessity for researchers to critically assess and be conscious of their own presumptions, biases, positionalities, and views. Reflexivity assesses the researcher’s position within the research and recognises the set of beliefs and presumptions that he/she has formulated through previous experiences and brings them into the research. It is a continuous critical engagement with the researcher’s function as a subjective agent. It is a method that a researcher employs to place him/herself within the research process and develops his/her ethical responsibilities towards participants. Researcher practices reflexivity throughout the study by asking him/herself how his/her presence, viewpoints, and interactions with participants could affect the study process and results. He/she then takes measurements to

reduce the effect of his/her own biases, preconceptions, and positionalities to produce more accurate and nuanced conclusions.

Reflexivity has emerged as a crucial methodological element in different fields of research such as education, sociology, and education. It has numerous benefits such as improving the overall quality, trustworthiness, and ethical rigor of the research. Researcher employs reflexivity as a methodological safety measure that enables the researcher to minimize biases, promotes ethical awareness, and maintains transparency through these rigorous practices (Corlett & Mavin, 2018). Reflexivity also helps the researcher to take into consideration any modifications or shifts that take place during the study. For instance, a researcher can modify his/her research questions or analytical framework if he/she discovers halfway through the study that their previous assumptions were too basic. This adaptability offers the findings more depth and credibility as it shows that the researcher is prepared to interact with complex reality rather than imposing predefined interpretations.

Conducting comparative studies in cross-cultural contexts is a sensitive issue and researchers sometimes bring their own biases, implicitly or explicitly, about their native culture or the researched culture (Creswell & Creswell, 2017). I was aware of this issue and did not prejudge which educational system in both countries (i.e., Egypt and Scotland) was better than the other. Taking the neutral position and not considering a dominant system has enabled me as a researcher to focus on the current practices in both countries to understand why these practices were taking place. To achieve this understanding, I asked the how and why questions to reveal the reasons behind these practices, the difference and similarities in both contexts, and the cultural factors too.

#### 3.9.2.1.4 Triangulation

Triangulation is a technique that researchers employ in qualitative research “to build a coherent justification for themes” ( Creswell & Creswell, 2017, p.199). Researchers employ triangulation to “mitigate bias” and add depth to the data collected. This, in return, enhances the authenticity and reliability of the research findings and conclusions and strengthens the audience’s confidence in these findings (Fusch et al., 2018, p.20). It also helps the researcher developing a persuasive argument of the research findings. Triangulation entails using a range of sources, techniques, and viewpoints to examine the research question from different angles and provide a more comprehensive picture of the phenomenon under study. Denzin (2009) proposed four types of triangulations that researchers should employ to enhance the trustworthiness of the research findings. These are data triangulation, investigator triangulation, theory triangulation, and methodological triangulation.

**A) Data triangulation** is the collection of data from different sites or contexts over extended time and from different individuals (Jentoft & Olsen, 2019). In the present research, I triangulated data through those three aspects. Regarding time, I collected data over an extended period of time by conducting semi structured interviews from April 2020 to January 2021. Secondly, I interviewed twenty secondary school teachers who teach different subjects and have considerable teaching experiences to understand how they utilise various ICT tools in their teaching practices. The variety of subjects those teachers taught and the ICT tools they utilised in the classroom provided a rich data about the phenomenon under study and enabled me to accumulate thick description of it. The COVID-19 pandemic has restricted the inclusion of other individuals such as head teachers and policymakers though I tried the best to include them. From my

point of view, their perspectives of the study problem would have enriched the data, and I intend to explore their perspectives in future studies. Space is the third aspect which was crucial in collecting rich data from different sites. In each interview, I confirmed with the initial contact from each context (i.e., Egypt and Scotland) that they refer a potential referral from a different school, if possible, which has happened in reality. Participants were working in different schools. Each school has its own management system that was reflected on the implementation of ICT. During interviews, I noticed that school management style and culture at work have impacted the procedures of ICT integration in these different schools and have affected participants' experiences in utilising ICT in their teaching practices. This in return has provided an in-depth description of the phenomenon and has enriched the credibility of the findings as well (Lemon & Hayes, 2020).

**B) Theory triangulation** is another technique that researchers employ in qualitative research to improve the breadth and validity of the research findings. This technique relies on combining and incorporating diverse theories and theoretical frameworks to enable the researcher achieving thorough perception of the study phenomenon (Noble & Heale, 2019). In the present research, I used various theoretical constructs such as behaviourism, constructivism, TPACK, TAM, and UTAUT. These theories and models have enabled me to understand teachers' experiences with ICT integration and its effect on the development of their teaching and pupils' academic performance (Fusch et al., 2018).

**C) Investigator triangulation.** This concept is concerned with involving multiple researchers to understand a particular phenomenon. These researchers collaborate with one another and contribute their experiences, research skills, and

diverse perspectives to the research activities (Campbell et al., 2020). Mitigating biases is one of the strengths of this concept as researchers collaborate in collecting and analysing data from different perspectives to enhance research credibility and validate the findings. Denzin (2009) contended that this concept does not apply to graduate pupils who are the main investigators in their PhD dissertations. So, I could not employ this type of triangulation in the present research.

**D) Methods Triangulation.** This approach focuses on employing multiple qualitative, quantitative, or mixed methods to study a specific phenomenon. It is one of the practices that researchers employ to investigate the phenomenon under study from different angles to provide answers to the research question (Campbell et al., 2020). Similar to the previous concept, the goal of this technique is to overcome the pitfalls and biases of a single method. Using multiple methods to collect and analyse data enable the researcher to compare and contrast the results, clarifies the deficiencies, and enhances the quality of findings better than employing a single method (Joslin & Müller, 2016). The primary intent in the present research was to visit schools in Egypt and Scotland for long periods to have prolonged engagement with participants and observe their experiences with ICT to have a detailed discussion of their perspectives of how they utilised ICT in their teaching practices. Due to the restrictions imposed due to the Covid pandemic, it was not possible to employ various methods to triangulate data and options were limited. However, I would say that the employed options in the present research were legitimate and have their strengths. They also have significantly impacted the research credibility and enhanced the findings and conclusions as explained earlier.

### **3.9.2.2 Transferability/Generalizability**

Transferability refers to the extent that findings from qualitative research could be applied to a different context with different participants under specific conditions (Carminati, 2018). It differs from generalizability in quantitative inquiry. Contrasting to quantitative research, qualitative studies are not designed to generalize their findings and, therefore, these findings should not be represented as common realities or final conclusions that can be hold accurate to all contexts (Smith, 2018). To determine transferability in a qualitative inquiry, the researcher should provide the targeted audience with thick description of the research procedures at all stages, assurance of the consistency of the data collection methods, and the relevance of the research findings to other contexts (Hays & McKibben, 2021). Rich description helps the readers forming their own judgement about the applicability of the research findings to decide whether they can be transferred to their own context or not. In the previous sections, I have provided detailed description and justification for the selection of the research procedures such as the research methodology, the size of the sample and characteristics of the participants, and data collection method. This detailed description should provide readers with a holistic understanding of the phenomenon under study, the legitimacy of the research procedures, and how these procedures have impacted the research findings. This should enable the audience and other researchers to judge the findings of the present research and decide whether they can replicate them in their contexts if they use the same procedures.

### **3.9.2.3 Dependability**

Dependability is the equivalent of consistency in quantitative research. It is concerned with the stability of data interpretation and results. Researchers endeavour to ensure the dependability of their research findings to achieve transparency and enhance research validity

(Adler, 2022). Dependability can be achieved through an audit trail which is a thorough documentation of the decisions and choices they have made. This starts with the selection of the research methodology and the theoretical framework and their applicability to the objectives of the research , the data set records, transcripts, and translation of transcripts, if applicable (Johnson et al., 2020). Audit trail helps other researchers to adopt the same procedures when studying the same phenomenon in their context and produce the same or similar results. I employed the thematic analysis (TA) model to analyse data as it is a flexible and systematic data analysis approach. These features have made the TA model an appropriate and practical analysis method in qualitative research as it enables researchers forming rich description of the phenomenon under study. Through the gradual phases of the TA model, I was able to identify the codes, sort them, and generate final codes and themes. All these procedures are explained in detail in the previous sections. I have also kept detailed records of data I have obtained from participants during interviews under secure measurements. These records are audio tracks of interviews, transcripts of each interview, and translations of Arabic interview transcripts that I have conducted with participants from Egypt. For the matter of transparency, accuracy and to guarantee the precision and accuracy of translations, I used a critical friend as a third-party from my social network in Egypt whose mother language was Arabic to verify these translations and highlight discrepancies, or misinterpretations of cultural nuances and idioms

#### **3.9.2.4 Confirmability**

Confirmability focuses on ensuring neutrality of data interpretation. Enhancing research confirmability can be achieved through different activities including peer-debriefing and member checking. Lincoln and Guba (1985) argued that research committee members cannot always be used in peer-debriefing as they have an “ authority relationship to the

inquirer”(p. 309). However, my research committee carried out the peer-debriefing as they hold extensive experience in qualitative research but not necessarily specific knowledge about ICT use in Scotland and Egypt. Their role was supportive and directive rather than being authoritative during the whole journey of the research. The monthly meetings over the long course of my PhD journey have enabled me to discuss my methodological and theoretical choices, the interview processes and possible changes in the probe questions to gain rich insights, the raw data and coding, the themes analysis, and the final findings and conclusions.

Research credibility can also be enhanced through member checking which is one of the most crucial methods for determining a qualitative inquiry's legitimacy (Liao & Hitchcock, 2018). Member-checking depends on returning back either part or all of the interview transcript or a brief report of the research findings to each participant and ask them to provide their verbal or written feedback to affirm that transcripts and findings report reflect their own words. This process enables participants to affirm that interviewer's interpretations reflect their perspectives of the phenomenon, amend some of the interpretations, and provide further feedback as well. The researcher employs this technique to enhance the credibility of the study and to persuade the audience that participants' perspectives have been fairly represented and the conclusions drawn in the report are credible to them (Wood et al., 2020). However, the restrictions imposed by the Covid pandemic impacted member-checking. Participants in Egypt and Scotland moved all their teaching practices to remote mode through the internet due to the restrictions. This issue formed an extra burden to participants and a stressful workload as participants have revealed during the interviews. I was not sure that participants would be able to comment on the transcripts, or the findings report that I would provide them in a later stage. Therefore, I decided to do member-checking on the spot. So, during each interview I used to repeat or rephrase some of the questions to confirm with



participants that my interpretations of their answers were accurate. Furthermore, after the travel restrictions were lifted in 2022, I travelled to Egypt and had the chance to meet the participants. I provided them with written parts of the report that include the themes and main findings. The majority of the participants ( $n=10$ ) confirmed that the transcripts reflected their views while two participants did not return the brief report.

### **Summary of Chapter Three**

This chapter presented the methodological procedures employed in the present research. It is significant to define the methodological procedures that underpin the research. They define the research design, the development of the research questions, and methods employed to collect and analyse the data. These procedures offer the audience insights into the study and enable them understanding the rationale behind conducting the study and what are the expected findings. The research approach is a further step that puts the audience into the scene and makes them aware of the research philosophy and acknowledge the researcher's philosophical stance as well. The methodological procedures also explain the validity and suitability of the nature of the research and the type of sampling method the researcher employed to collect the data. They further enable the audience to understand the recruitment procedures the researcher has followed to recruit participants, the ethics measurements that has been put in place, and the type and mechanism of interviews as well. Finally, all these elements support the researcher in selecting an analysis method that is relevant to the collected data to produce tangible results.

In the next chapter, I will discuss the findings of this research and will present a detailed analysis of the data that has been formed in a number of themes and subthemes.

## Chapter Four

### Research Findings

#### 4.0 Introduction

This chapter presents the research findings that emerged from analysing the set of data. The analysis resulted in the emergence of the below themes:

- Access and engagement
- Pedagogical practices
- School environment

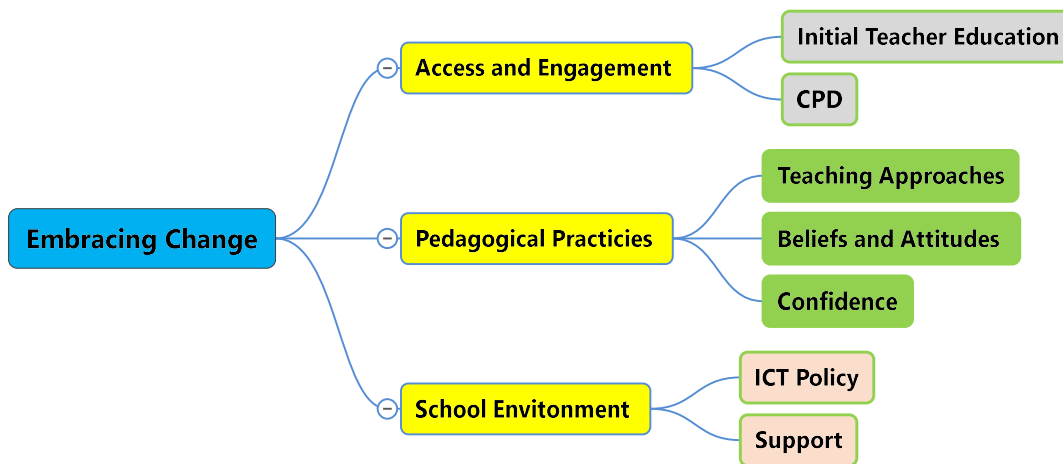
The overarching theme is entitled: ***Embracing change***. In the following sections the aforementioned findings will address two main aspects: a) the effect of ICT integration on teaching and learning, and b) the existing barriers and practical solutions for ICT integration. These aspects summarise the objectives of the present study and aim to provide answers to the research's overarching question and the sub-ordinate questions as well

**What are the experiences of secondary school teachers who integrate ICT into their classroom pedagogical practices in Egypt and Scotland?**

*Subordinate questions:*

- 1- *What are the perceived advantages of ICT integration within secondary education in Egypt and Scotland?*
- 2- *What are the perceived difficulties of ICT integration within secondary education in Egypt and Scotland?*
- 3- *What are the similarities and differences between Egypt and Scotland regarding ICT integration at secondary education?*

In line with best practice, the following figure outlines the main themes and their relationship with the sub- subthemes (Braun & Clarke, 2006).



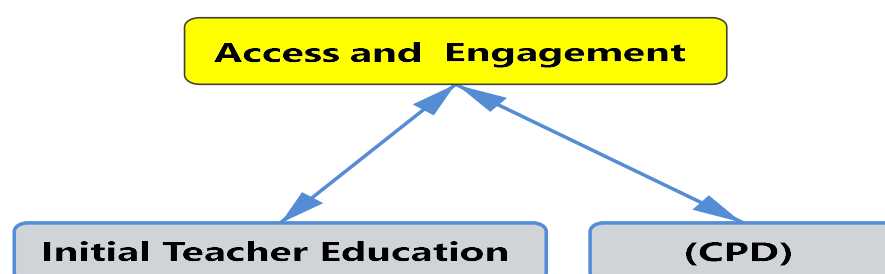
*Figure (6) The Overarching theme*

The following sections discuss the findings developed from the analysis of each theme and its subthemes. These findings are described thoroughly and supported with quotes from participants' replies to the interview questions.

#### **4.1 Theme One: Access and Engagement**

The first theme reflects the available opportunities for participants during their initial education at faculties of education and the post graduate diploma (PGDE). These opportunities were about their access to relevant preparation courses during their initial teacher education (ITE) and their engagement into further continuous professional development courses (CPD) after they join the teaching profession. The theme discusses the influence of these preparation courses in empowering participants' pedagogical knowledge and developing their essential ICT skills they need for their teaching professionalism. The subthemes discuss the role of Teachers Initial Education (ITE) and the Continuous Professional Development (CPD) in facilitating ICT integration. Findings of this theme

presents teachers' evaluations of their experiences with the structure of the ITE programmes and the experiences they accumulated during school placement(s) as well. The findings define the role of these experiences in shaping participants' perception of teaching and learning. In addition, they present the role of (CPD) courses in developing teachers' teaching skills and scaffold them with the required teaching knowledge. This knowledge should enable them to understand the role of ICT integration in enhancing their teaching practices and developing their pupils' learning performance. The below figure presents the theme and its sub-themes:



*Figure (7) Theme One*

#### **4.1.1 Subtheme One: Initial teacher education (ITE)**

This subtheme provides a detailed description of the structure of ITE programmes in Egypt and Scotland. It defines the differences and similarities between ITE programmes in both countries and explores the role of these programmes in forming pre-service teachers' knowledge about teaching and learning. It explores the role of these programmes in providing pre-service teachers with the adequate knowledge about the subject content, pedagogy practices, and education technology. Findings revealed that ITE programmes in each context have their unique characteristics that were perceived by participants as either barriers or facilitators to ICT integration in their future pedagogical practices.

#### **4.1.1.1 The Egyptian Context**

Findings revealed that there were two routes of initial teacher education (ITE) in Egypt: faculties of education and the Post Graduate Diploma of Education (PGDE). The length of ITE programmes in faculties of education is four years while the PGDE programme is one year. Pre-service teachers at faculties of education study a subject of specialisation over four years in addition to several education courses. Thus, in this route it is not a requirement for pre-service teachers to study the one-year PGDE. The second route of initial teacher education is the one-year PGDE. This route is dedicated for graduates of subject-specific faculties such as arts, science, law, and commerce. Study in these faculties does not focus on preparing pupils to become teachers in the future. Rather they are mostly prepared to join different jobs other than teaching. Therefore, it is mandatory for them, particularly for fresh graduates, to study a one-year Post Graduate Diploma of education (PGDE) if they wish to become an intermediate or secondary school teachers. However, it is not obligatory for older graduates who are teaching right now at intermediate or secondary education to study for PGDE unless they wish to be promoted to a higher position. Graduates of the first route (i.e. faculties of education) are always offered the priority to be recruited in the teaching profession. Graduates of subject specific faculties are offered the opportunity to join the teaching career only to fill the shortage gap in teaching staff.

Findings showed that the established goal of both routes (i.e., faculties of education and the PGDE) is to provide the labour market with qualified teachers who can efficiently teach various subjects at the pre-university education. Courses at both ITE routes aim to support pre-service teachers' educational needs and enable them to form a solid basis of the subject matter content and theories of teaching & learning as well. Modules about the integration of ICT in education in both routes formed a small percentage of the curriculum. Technology tools also were not enough compared to the high number of pre-service teachers.

Technology suites were mostly dedicated to pre-service teachers at the department of computer sciences. Participants confirmed that they had limited access to ICT tools such as overhead projectors and desktop computers.

Findings showed that pre-service teachers at faculties of education attend a 60-week block of school placements over four semesters during the 3<sup>rd</sup> and 4<sup>th</sup> year of their studies. Each semester, they go to schools for placements for one day per week over fourteen weeks. During that day, they spend four hours in the classroom observing how expert teachers teach and use ICT in the classroom. On week fifteen, they go to schools every day and spend six hours each day with expert teachers. The second route (i.e., PGDE) lasts for thirty weeks that are divided into two semesters. Pre-service teachers at this route do not always go to school placements to practice teaching in the classrooms. Some universities may arrange placements at schools while others engage them in mini teaching session at the universities over the course of the PGDE. School placements in this route start at the second semester for fourteen weeks and pre-service teachers spend the same number of days and hours as their counterparts in the first route (i.e., faculties of education).

Findings revealed that during these placements participants were able to observe expert teachers, became familiar with pupils' characteristics and their individual learning needs, and understood how to use different teaching strategies to deliver the lesson content. **Sawsan**, for example, graduated from faculty of education twenty-five years ago. She confirmed that she studied different modules of psychology, teaching theories and learning approaches, and educational technology as.

***Sawsan*** “During the undergraduate study, I have studied, you know, 12 or 13 educational modules about psychology, comparative education, school management,

*teaching methods, and educational technology in addition to the subject specific courses too.”*

**Sawsan’s** experience with educational technology and practicing using it at the university was exciting. She said that ICT tools were available in the faculty. However, she noted that the large number of pre-service teachers that time outnumbered the available ICT tools, and this has minimised their opportunities to practice using these tools and understand how to integrate them in their future teaching practices.

**Sawsan** *“There was a lab that has various educational technology tools such as overhead projector, 5mm cameras, cinema camera and desktop computers. However, we were too many in the class, while the available tools were not enough. It was, of course, difficult to allow everyone to practice operating and using them.”*

School placements for Salwa was the practical element to practice teaching. Sawsan confirmed that school placements were noticeably short for her to observe how expert teachers utilise the different teaching approaches and manage the classroom. She also said that after a brief period of school placement, she was allowed to teach a full day by herself and without the presence of an expert teacher to mentor and guide her. She justified this saying that this always happened to them as pre-service teachers due to either the shortage of teachers at schools or if any of the pre-service teachers declared that he/she was able to teach a full period unattended.

**Sawsan** *“It was one day every week then a full week at the end of each semester of the 3<sup>rd</sup> and 4<sup>th</sup> year. The classroom teachers just shows us how they plan the lesson, introduces us to the pupils, then we observe how she/he teaches and manages the classrooms. I can say it was a short period. Mentors used to monitor us at the first few days then leave us to teach a full period on our won.”*

However, she considered school placements an interesting experience that enabled her to implement the teaching and learning theories she studied into practice. Furthermore, during that period she discovered her personal traits as being a teacher by nature. Nonetheless, Sawsan was not able to use ICT during these school placements because ICT was not available in classrooms that time. There was only the multi-media suite (*Manahel Al Maarifah- Sources of Knowledge*) and pre-service teachers were not allowed to use this multimedia suite during their school placements.

**Sawsan** *“We were only allowed to practice teaching in the classrooms. At that time, there was not any technology tools available in the classrooms. There was only chalk and board and Manahil Al-Maarifah suite that we were not allowed to use.”*

Another participant, **Mervat**, shared her experience with ITE programmes at the faculty of education. Though she graduated from the faculty of education almost a decade ago, she said that the structure of ITE programmes still the same as those programmes at the time of the earlier participant (i.e., Sawsan). Mervat confirmed that she studied different modules about pedagogy in addition to an ICT module. She said that this module was more theoretical than practical.

**Mervat** *“Beside the subject-specific courses, we studied many educational modules. I remember we studied a module about ICT. It was mainly about the components of the computer and how to use it in teaching.”*

**Mervat** also confirmed that there were different ICT tools available in the faculty but there were too many pre-service teachers as well. Therefore, she said that she was not able to learn how to use these tools in teaching.

**Mervat** *“We were too many in the department. Lecturers used to divide us in groups. I think about 50 students in each group. They only showed us different ICT tools such*



*as the data show projector, cameras, and desktop computers and how to operate them but they, rarely, would allow us to use them.”*

She mentioned that there was a computer suite at the faculty of education. This suite was equipped with a number of computers, but it was only for pupils who study computer sciences while other departments were not allowed to use it at all.

**Mervat** *“There was an ICT suite at the faculty. Those who study computer science were the only ones who were allowed to use it as this was their subject of specialisation.”*

Contrary to Sawsan and Mervat, graduates of subject- specific faculties did not study any modules pedagogy or ICT modules. Faten, Anwar, and Kamal were graduate of faculty of arts and literature. They have long experience teaching English and French as foreign languages at secondary education. Kamal and Anwar did not study PGDE and never had the opportunity to go to schools for placements. Faten has studied two PGDE diplomas before joining the teaching profession. She said that these diplomas provided her with a solid basis about teaching practices, class management and how pupils learn. Therefore, she was able to overcome her lack of knowledge in pedagogy and teaching and learning theories. However, she did not have the chance to implement such knowledge during school placements because it was not part of the PGDE according to her.

**Faten** *“In faculty of arts the study was an intensive subject- specific that focuses on the study of the English language grammar and literature. I studied courses of teaching methods, mental health, and comparative education at the one-year PGDE. After that, I studied a special educational diploma to study in-depth modules about teaching methods. Unfortunately, I did not have the chance to attend school placements.”*

She also studied a module of ICT as part of the PGDE. This module was about the history of the computer, its components, and how to use it in teaching and learning. Furthermore, she conducted a mini research project during the PGDE that discussed the relationship of technology to education development and how to integrate technology into teaching and learning. However, she confirmed that the study was theoretic in nature, and there was not any practical activities.

**Faten** *“I only studied about the history of computer and wrote articles about it in the general diploma. As for the special diploma, I carried out research on the relationship of computers to teaching and how to use it in education. I also studied the components of the computer and its history. But all this was only in theory and there was no practical training either in college or diploma.”*

Anwar and Kamal had different experiences than those of Faten. After graduation, they joined the teaching profession though they have not studied any modules of pedagogy or ICT. To overcome this deficit, they have read different resources that focus on the know-how of teaching and learning. They also attended several training courses to enhance their pedagogy knowledge and received help from expert teachers as well.

**Anwar** *“At first, I had no experience in teaching, and I did not know much about teaching approaches or how to manage the classroom. So, I read a lot about teaching methods to develop my teaching abilities. Also, the mentor, the school principal, and colleagues guided me, and I have learned a lot from their experience about how to teach, how to manage the classroom and how to plan a lesson.”*

Kamal said that he was able to build up his knowledge of teaching methods by attending a number of training courses, workshops, and conferences. He confirmed that these activities

improved his teaching skills and widened his knowledge about how to teach and how pupils learn.

**Kamal** *“The teaching profession did not appeal to me at first and I had to work as a teacher due to family reasons. However, I loved it afterwards and I was able to strengthen my knowledge about it and perform it successfully. I used to look for any training courses and join them to develop my teaching abilities. I also used to participate in local, regional, and international conferences and workshops.”*

Kamal, also, received external training for few months in the USA early in the 1990s. During that period, he became aware of the significance of ICT integration into teaching and learning. That training in USA was the first opportunity for him to practically use educational technology into teaching. At that time, the MoETE introduced the Manahil Al Maarifah project into schools and, therefore, Kamal was able to implement that knowledge in his teaching practices.

**Kamal** *“When I was in America, we had a training course on the use of computers and the Internet and how to create a personal email. After returning from America, MoETE provided schools with Manahil Al Maarifah suites, so I applied what I studied in America and began to use this suite to teach.”*

#### **4.1.1.2 Scottish Context**

In Scotland, findings revealed that the General Teaching Council for Scotland defined four routes to becoming a secondary school teacher in Scotland. These are:

1. a four-year combined undergraduate degree
2. a combined undergraduate degree or a concurrent undergraduate degree including studying a subject, studying education, and school experience

3. a PGDE programme following an undergraduate degree
4. a postgraduate or integrated master's programme including a teaching qualification

Findings revealed that majority of participants have studied a four-year undergraduate subject-specific degree in addition to a one-year Post Graduate Diploma of Education (PGDE). Rest of participants have either studied an integrated master's programme with a teaching qualification or a Doctorate degree. Participants said that these qualifications were essential requirements for the probational registration which entitles them to become qualified teachers. Findings showed that these routes provided participants with in-depth knowledge of the subject matter content, teaching and learning theories, classroom management, and the integration of ICT into pedagogical practices. Finding also showed that school placements at the aforementioned teaching routes were essential and long enough. Pre-service teachers either spent 30 weeks at schools over the four years of their study at school of education, or 50% of the length of the PGDE (i.e., 18 weeks). Findings showed that participants were required to attend these school placements on full time basis every day and for five days a week. Participants confirmed that observing expert teachers in the classroom during these long school placements helped them to gain considerable experience about how to teach and how to integrate ICT in their teaching practices.

**Craig**, for example, confirmed that for him to become a qualified secondary school teacher of biology, he studied a subject- specific qualification in addition to a one-year PGDE.

***Craig** "Most people do a degree in a particular subject, like mine in biology, which is not a teaching degree. If you decide later to be a teacher, you go and study PGDE as an extra course for one year and like this you become a qualified secondary school teacher."*

For him, the PGDE was an intensive course that focused on theory and practice. The theoretical element of the course enabled him to gain comprehensive knowledge of pedagogy and teaching theories, educational research and policies, and the interrelationship between pedagogy and educational technology.

**Craig** *“PGDE was about pedagogy and practice which is about governmental policies, current educational research and how you can integrate them into practice. You do get some training, and you can get more training that is mostly about the use of a smartboard in teaching.”*

Then, he was able to implement this knowledge during school placements which was the practical part of the PGDE.

**Craig** *“There is a practical part too. I have got 3 placements between 6 and 8 weeks for each placement. First you observe other teachers and then you start getting your own classes and start teaching and then full-time teachers observe your teaching and provide their feedback about your performance.”*

Findings also revealed interesting experience of another participant’s during the PGDE.

**Olivia** described her experience while studying the PGDE diploma as a wonderful opportunity for her to understand how to teach and how pupils learn. She confirmed that the study of the PGDE enabled her to build up a coherent educational background about teaching and learning strategies and how to use them in developing pupils’ academic outcomes.

**Olivia** *“We have studied topics about how to teach the subject in different ways to make learning more engaging, the different ways about how students learn, the different methods such as collaborative learning that is about getting students working together to solve a problem.”*

She also said that she was trained to use ICT tools and how to employ them in teaching and learning. This type of training helped her to understand the role of ICT tools in engaging pupils and improving their learning.

***Olivia** “We have also studied using different forms of technology to teach them and engage them in learning. The most specific module was about how to use the interactive white boards and how to use the different features that it has and how to use power point presentation or similar programmes to display information and present it clearly.”*

For **Olivia**, school placements were also significant. During these placements She was able to fulfil her personal passion to become a teacher and practice teaching and learning in a real context.

***Olivia** “The whole reason that I wanted to get into teaching was that I enjoy working with young people. We start the placement by doing a small 10 to 20 minutes portion of the lesson and then towards the end of the placement, the mentor teacher just sits and observes you and gives you feedback and then lets you lead on your own.”*

She said that during school placements she received support from expert teachers in the department. That type of support, she said, helped her to implement the theoretical aspects she studied about teaching and learning and enabled her to use the available ICT tools in the classroom to deliver the lesson content. These experiences increased her level of confidence in her teaching abilities and improved her technology skills as well.

***Olivia** “I was never just thrown in. My mentor helped me with lesson planning, behaviour management, and classroom management. In the department they had interactive touch screen boards. I was informed on my first day the different ways to*

*use it. I think the department, as a whole, were really good and indicate me the different ways, I could make the most of the board.”*

#### **4.1.2 Subtheme Two: Continuous Professional Development (CPD)**

Findings from this subtheme varied in both contexts. Participants from each context expressed various perspectives about CPD programmes in their countries. These various perspectives enriched the scope of the present study and presented a holistic picture of the phenomenon under study and showed how it affected participants’ professional development.

##### **4.1.2.1 Egyptian Context**

Findings from Egypt about professional development (CPD) were related to the technology projects that were introduced at secondary schools such as Manahil Al Maarifah, the smart/ interactive boards, and the tablet. These projects affected participants’ experiences with ICT integration in their pedagogical practices.

##### **i- Manahil Al Maarifah (Sources of Knowledge)**

Manahil Al Maarifah was the first project implemented by the Ministry of Education and Technical Education (MoETE) in the 1990s. The main goal of the project was to introduce ICT technology at secondary schools. Manahil Al Maarifah are multimedia suites that are equipped with a desktop computer connected to an overhead projector, a display screen, TV screen and a video player. The project aimed to help teachers understanding the significance of ICT integration and how it can help them in developing their teaching practices and enhance pupils’ learning performance as well. Findings revealed that participants have received CPD training courses about the use of ICT technologies of Manahil Al Maarifah. However, they asserted that the content of these courses focused on the use of teaching approaches to deliver the subject-content, how to use computers in teaching and learning, and class management.

**Wael**, for example, is a social studies teacher with extended teaching experience at secondary education. He said that he joined different training courses and video conferences held by the MoETE to keep himself well-informed about pedagogy and technology. For him, most of CPD courses were not goal- oriented and prioritised theoretical aspects more than the practical application of the knowledge.

***Wael** “In many of training courses there were a mix of primary, intermediate, and secondary school teachers. The content at some of these courses was applicable to primary school teachers and cannot be implemented at secondary schools as each stage has different ways of teaching and learning.”*

He said was able to recognise the vital role of technology in developing his pedagogical practices and pupils’ learning performance. Therefore, he was keen on using ICT tools at Manahil Al Maarifah suite since he has joined the teaching profession.

***Wael** “When I started working at secondary school, there was a desktop computer in Manahil Al Maarifah suite, and I used to use it every week to teach the subject content I teach which is geography. Attending classes in this suite was something impressive to pupils and they used to prepare well for it.”*

He said that one of the training courses he attended in the early years of his teaching profession would have been an effective training however, there were some issues that did not help in it success. For him, the declared goals of the course, the course management, and the way of presenting the course content did not meet the expectations of attendees. He said that the course would have resulted in the development of his teaching capabilities in integrating ICT in his pedagogical practices if it was delivered as planned.

***Wael** “The main goal of the course was to train us how to design classrooms exercises & quizzes and computer-based content presentations. This was to motivate*



*pupils and help them understand the lesson content. Unfortunately, the training was theoretical, and we did not actually use computers to apply such knowledge.”*

Another exemplar was **Hossam** who supported the earlier participant’s views about CPD courses. Hossam has considerable experience in teaching Mathematics to secondary school pupils in Egypt and other countries as well. He asserted that he has attended various CPD courses that discussed the integration of ICT in education. However, he noted that the content of these courses was not relevant to ICT integration into teaching and learning. Rather, these courses provided information about teaching theories that focused on the use of traditional teaching approaches that were not suitable for the subject he teaches. He asserted that these courses could have been useful if their content focused on training teachers how to integrate ICT into interactive teaching and learning approaches to improve pupils academic performance.

***Hossam** “Training courses were mostly theoretical and focused mainly on developing teacher's competence in terms of teaching methods rather than improving our skills in the use of technology. Yes, we received various training courses about the use of technology in education, but they were far away from the use of technology in education. They focused on the development of teaching methods and always depended on the theoretical aspect.”*

## **ii) Smart/ Interactive boards and the Tablet**

Recently, the MoETE equipped classrooms at secondary schools with interactive boards and provided teachers and pupils with educational tablets to expand access to ICT rather than limiting it at Manahil Al Maarifah. The MoETE said that availability of interactive boards and educational tablets in the classroom should help secondary school teachers employing them on daily basis to enhance their teaching practices. Findings revealed

that professional development courses right now were different and better than those provided at the time of Manahil Al Maarifah. **Meena**, for example, has an extensive experience in teaching English as foreign language at secondary schools. He asserted that when interactive boards were fitted into classrooms, he received training courses about how to operate and utilise them in his teaching practices. For him, these courses were well-arranged, supported with relevant content, and presented professionally. He said that these courses provided him and his colleagues with robust knowledge about the employment of the interactive boards in their pedagogical practices.

***Meena** “The local educational authority provided two training sessions for us to understand how to use the interactive board. Also, it sends technicians periodically to train teachers at schools and help them dealing with technical problems”.*

For **Meena**, these training courses helped him to understand how to employ the features and Apps of the interactive board in different learning activities. He said that accumulating such knowledge helped him to employ the interactive boards in daily teaching and learning activities. These tools, for him, have eased the delivery of subject content in a better way than the traditional teaching approaches. He further contended that he was able to train other colleagues and helped them to employ interactive boards in their teaching practices. He further confirmed that he noticed that these tools have increased pupils’ level of interaction and engagement at learning and improved their academic performance.

***Meena** “I can say technology has eased teaching for me. I was able to use power point presentation, audios, and videos to present the content in an interactive way. This way of presentation saved me time and effort and helped me adopt better learning approaches. I can, also, say that technology helped my pupils understanding the main ideas of each lesson much better than before. I noticed that they are*

*cooperating and working in groups more than before. I also trained my colleagues about the use of the interactive board.”*

Meena’s experience in using the educational *tablet* for teaching and learning was different from that of the interactive boards. He said that the tablet project was one of the inspiring projects implemented by the MoETE. Training courses related to the use of the tablet were, for him, effective and helped him to recognise the goals of this project. He also said that the use of the tablet, as a portable technology, is a further step in digitising education.

**Meena** *“I received many training courses about the use of the tablets in creating quizzes and exams that simulate pupils’ intelligence and motivate their critical thinking instead of the traditional methods of drilling and memorization.”*

However, Meena said that the integration of the *tablet* in teaching and learning was far away from the planned goals. He noted that instead of employing the *tablet* as an efficient learning tool, it is now used only as an electronic platform for final exams. He confirmed that this issue has restrained the use of the tablet as an advanced portable technology that could help both teachers and pupils to enhance their teaching and learning experiences.

**Meena** *“Unfortunately, MoETE has restricted many applications and educational features on the tablet, and it is now used only by pupils to perform assessment exams or accessing the EKB to get supplementary materials.”*

#### **4.1.2.2 Scottish Context**

Scottish counterparts have their unique experiences of CPD as well. Findings from Scotland revealed that it was compulsory for participants to attend various CPD courses over the probation year which is their first year at the teaching career. Participants said that these courses formed an integral part of their assessment to become fully qualified teachers. They noted that during the probation year, they have to register in a number of compulsory training

courses to accumulate further pedagogy knowledge to enhance their teaching skills. They also said that these training courses were essential for them to improve their teaching skills and to widen their knowledge about the subject content and other educational issues that support pupils' learning performance. They further said that these courses equipped them with relevant knowledge about classroom management, pupils' mental health, behavioural management, and the use of ICT in teaching and learning.

**Marlyn**, for example, has been in the field of information technology (IT) for long time. She recently changed her career and joined the teaching profession to teach computer sciences. Though she described herself as proficient enough to teach the subject, she said that she was still in need to have further training courses that could help her understanding how to teach and how pupils learn.

***Marlyn** "There is what you call Continuing professional development programmes. I have joined many of these programmes when I was a probationer as they were compulsory, and I have to take. Most of these programmes were quite interesting but not all of them were about my subject IT particularly. They were about other sort of things. I also did some training in Microsoft Teams because I thought I was not quite confident about how to use it."*

**Rehana** supported Marlyn in this regard. During the probation year, she confirmed that she joined different mandatory training courses. She contended that these courses increased her knowledge of teaching and learning and how pupils learn, how to improve pupils' critical thinking skills, how to manage classrooms, and how to integrate ICT into teaching and learning practices.

***Rehana** "We have to do some mandatory CPD training. There are different training courses in every aspect of teaching. You can do training course in behaviour*

*practices and effective questioning. There are also available training courses of pedagogy such as Higher order thinking skills, effective questioning, effective feedback, how to use different educational Apps, and assessment arrangements. We constantly held these courses at school informally to improve each other's teaching and learning skills."*

When the iPad project was implemented, Rehana said that there were online and face-to face CPD courses available for teachers around the year. She also said that these courses enabled her to learn how to use the interactive features and applications of the iPad in her teaching practices and how to use them to increase pupils' engagement and enhance their academic performance.

**Rehana** *"We have a Continuous Professional development (CPD) calendar around the year that allows teachers to attend workshops that explains the different features of the iPad such as Pages, Keynotes, and the different educational Apps and how to efficiently use them in teaching and learning. So, I can say there is a huge amount of support."*

## **Summary of Theme One**

This theme discussed a number of issues. It first discussed participants' experiences with their initial teacher education (ITE). It then explained the role of the in-service continuous professional development (CPD) in forming and developing participants' knowledge of the pedagogical practices, subject matter content, and ICT technologies. After that, it discussed participants' perspectives of school placements and their role in shaping their primary teaching experiences and preparing them to join the teaching profession. Furthermore, the theme presented participants' experiences with ICT integration and its importance in developing their pedagogical practices. The theme showed how participants

were able to employ ICT in the classroom to deliver meaningful teaching and learning experiences. Finally, it discussed the effect of in-service professional development (CPD) on their teaching practices.

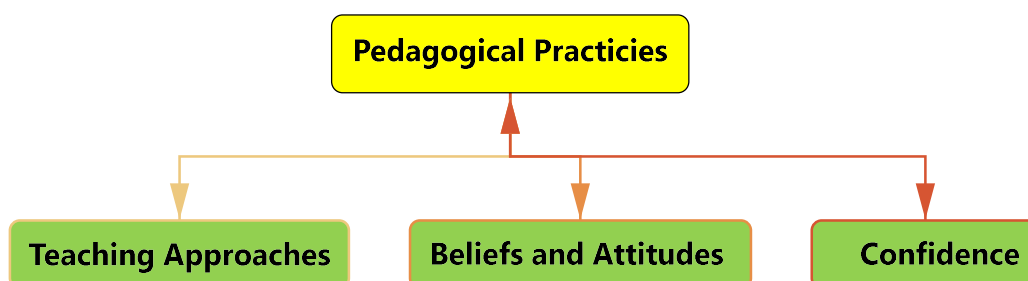
Findings of the theme showed that ITE programmes differed from one country to another. They depended on the vision, philosophy, and the established policy of each country's educational system. Findings revealed that each country has placed the specific goals and expectations of teachers' initial education (ITE). They confirmed that the goals of ITE programmes formed the basis for the standards that stakeholders have followed when designing the ITE programmes to attract individuals to the teaching profession. Findings also showed that stakeholders designed sustainable ITE programmes to support the development of pre-service teachers' knowledge of the subject content, pedagogy, and technology knowledge. These programmes aimed to enhance participants' awareness of the significant role of ICT integration in the development of teaching and learning.

Findings showed that continuous professional development (CPD) was concerned with the organisation of workshops and training courses to develop in-service teachers' teaching skills and enhance their knowledge of the subject matter content, pedagogical practices, and technology skills. CPD courses did not only focused on developing novice teachers' teaching capabilities, rather it targeted expert teachers to enhance their current teaching skills. It aimed to raise in-service teachers' awareness of any recent changes at the curriculum or if there will be a new curriculum. The provision of CPD can be in different forms. It could be presented either on-line to overcome the geographical distances and to help as many teachers as possible to take part in, or face-to face at schools or at the headquarters of local authorities where possible for teachers to attend.

In conclusion, well-structured ITE programmes provided pre-service teachers the opportunity to become well-prepared for their future profession while CPD enables in-service teachers to recognise the recent approaches about the best teaching and learning practices. Both elements enable teachers to recognise the potential effects of ICT integration on the development of teaching-learning process.

## 4.2 Theme Two: Pedagogical Practices

Findings from the second theme focused on the pedagogical practices that participants employed in the classroom. These findings discussed participants' beliefs and attitudes towards the integration of ICT in their teaching practices, the teaching approaches they implemented, and their level of confidence in using ICT. The theme also discussed participants' experiences with ICT integration in their pedagogical practices and the opportunities and the barriers they perceived. This theme has three subthemes as shown in the below figure:



*Figure (8) Theme Two*

### 4.2.1 Subtheme One: Teaching approaches

Findings from this subtheme focused on the types of teaching approaches that participants have used in the different teaching situations. The findings explored the extent to which participants used or were able to use ICT in their teaching practices and the factors that affected their preferences.

#### 4.2.1.1 Egyptian Context

In Egypt, findings showed that interactive boards were available in the classrooms at secondary schools. Participants considered the introduction of interactive boards in the classrooms was an innovative step towards the modernisation of teaching and learning practices. They asserted that these interactive boards have many features that they can employ to facilitate their teaching practices. Findings showed that participants were keen to shift from traditional teaching approaches to more constructive teaching approaches that can enhance pupils' critical thinking skills. **Nasir**, for example, has been teaching physics at secondary education for over twenty-five years. For him, the introduction of interactive boards in classrooms enriched his teaching experience in diverse ways. He believed that the usefulness and the ease of use of the interactive board supported him to integrate it into his daily teaching practices.

***Nasir** “Currently I am using the interactive board in my teaching practices. I believe it is one of the technology tools that has effective properties. It was not difficult for me to operate and use its features and the Apps. I use these features and Apps to present the lessons in an easy way and deliver the curriculum effectively.”*

He confirmed that providing this type of interactive board was a supportive factor for him to move from traditional teacher-centred approaches to more constructivist student-centred approaches. He contended that the interactive board has enabled him to present the content of the subject in more attractive ways than traditional methods. He also said that the continuous utilisation of the interactive board increased pupils' level of interaction and attainment.

***Nasir** “Currently, I use the interactive board every day. It is one of the technology tools that has effective properties that helps me present the subject matter in a better*



*way and conduct different physical experiences in an interesting and attractive way. This interactive board also helped me to make different interesting lessons and improved pupils' understanding of the subject matter content. Also, many of them contribute their ideas to the experiments to discover the extent to which these variables affect the final product of the experiment.”*

Access to internet, learning Apps, and the other interactive features of the interactive board were, for him, supporting factors to enhance his teaching practices and adopting more communicative teaching approaches. He said these communicative teaching approaches have enhanced pupils’ level of engagement and have made them feel they were in control of their learning rather than being in passive position.

**Nasir** *“After employing traditional teaching methods for long time, I started to use the cooperative learning approach because I found it extremely useful for pupils ‘different learning needs. For example, I use an App to perform different physics experiments. I do not do things alone. My pupils are always there with me, share their opinions and suggest diverse ways to perform the experiment. I can say that these features improved their thinking, and their grades are better than before.”*

**Meena** also supported Nasir’s perspectives. For him , interactive boards supported his teaching practices and made him spend less efforts in delivering the curriculum than he used to do with traditional teaching practices. He considered it a reliable source of technology and an alternative method to textbooks. He said that the interactive board helped him to improve his knowledge of the subject matter content. He also said that he was able to use it to access search engines on the internet, the Ministry of Education and Technical Education (MoETE)’s official website, and the Egyptian Knowledge Bank (EKB). These digital sources enabled him to stream live audio/videos and download supplementary materials. This, in

return, expanded his knowledge of the subject matter content, the latest pedagogical approaches and the efficient integration of ICT in teaching and learning. It also improved pupils' knowledge of the subject matter content, enhanced their academic level, and prepared them well for final exams.

**Meena** *“There was a clear difference between teaching in traditional classrooms without technology and teaching with interactive boards. I can say that this technology made it easier for me to teach the curriculum better. Right now, I display videos that explain the content of lesson to help pupils benefit from watching the content and listening to native speaker to improve their pronunciation.”*

However, overcrowded classrooms and the design of the curriculum formed barriers to achieving what Nasir has mentioned earlier. Though he has been using the interactive board on daily basis, he was not able to use the same innovative teaching approaches in overcrowded classrooms. Though, he said that the interactive board formed an integral part of his daily teaching practices, he confirmed it was difficult for him to use it in overcrowded classrooms.

**Nasir** *“It is difficult to implement modern teaching approaches because of the large number of pupils in the classroom that accommodate forty pupils or more. Cooperative learning requires classes with small number of pupils.”*

**Meena** also supported Nasir' perspectives. He said that he used to use traditional teaching approaches before the introduction of “Manahel Al Maarifah” and interactive boards as well. He said that this was due to the dominance of rote teaching and learning approaches before the introduction of ICT in education. He further concluded that teachers were not able to change this to constructivist teaching strategies as pupils have got used to this type of learning.

**Meena** *“We all used to use traditional teaching methods before the introduction of technology because the curriculum is designed on memorization.”*

**Meena** also agreed with the earlier participant (i.e., Nasir) about the effect of overcrowded classrooms on his efforts to integrate ICT in his teaching practices. He believed that overcrowded classrooms formed a barrier for him to employ ICT in his teaching practices or implement student- centred approaches to replace the traditional methods. He concluded that overcrowded classrooms did not allow him to provide equal learning opportunities to pupils and minimised the student-student and student- teacher’s level of interaction.

**Meena** *“I can say that the small size of the class that accommodates large number of pupils and the way it is organised does not help me to use modern teaching approaches such as work groups or cooperative learning to improve pupils’ academic performance.”*

Furthermore, findings revealed that curriculum design was another factor that affected participants’ choice of their teaching approaches. **Yassin** is an experienced teacher who has been teaching English as a foreign language for long time. He said that the curriculum was gigantic, and he has to deliver many lessons in short period. For him ICT integration would have been effective if the present curriculum was restructured to encourage critical thinking skills rather than spoon-feeding learning. He said that secondary school pupils still depend on spoon-feeding learning because the current curriculum still depends on rote learning and final exams as the sole assessment tool.

**Yassin** *“3<sup>rd</sup> grade pupils at secondary school study large curriculum and the length of the academic year is not enough to cover all of it. Due to the nature of the secondary school exams which depends on the method of memorisation and indoctrination, we*

*are forced as teachers to use the spoon-feeding method so that pupils can study all aspects of the curriculum to pass the exam.”*

**Safwat** is another participant who supported Yassin’s perspectives. Safwat has been teaching English as a foreign language at a public experimental school. This is a type of public funded schools where all subjects are taught in English except Arabic language and religious studies. Safwat said that he was not able to integrate and use the interactive board widely into his teaching practices due to the enormous size of the curriculum. Similar to Yassin, Safwat confirmed that he has to cover all these lessons and prepare pupils for final exams in a short period of time before the end of the academic year.

***Safwat** “According to the study plan sent by the Ministry, we must teach large volume of the curriculum in a short period of time. This for sure affects the quality of the educational process and did not offer us as teachers the opportunity to integrate technology in teaching appropriately. Therefore, the use of the interactive board is limited most of the time.”*

Findings revealed that MoETE declared that the *tablet* project has three goals: a) to replace the traditional textbooks; a) to be integrated into the whole areas of the secondary education curriculum, and c) to be used as an electronic platform to perform final exams electronically instead of traditional exams (i.e., paper and pencil). However, findings did not show correlation between the current curriculum and the goals of the *tablet* project. The current curriculum still depends on rote learning and ICT is not integrated into the learning activities of each subject. Participants confirmed that MoETE declared that electronic exams for grades 10, 11 and 12 at secondary education were designed to encourage pupils’ critical thinking and problem solving, however the present curriculum still depends on rote learning and memorisation.

**Faten** *“Issues such as how the questions and knowledge are presented in the curriculum need to be changed to increase pupils’ critical thinking. What has happened yet was the change of exam questions while the curriculum design still the same where memorisation is dominant in it.”*

#### **4.2.1.2 Scottish Context**

In Scotland, findings showed that classrooms were equipped with desktops, overhead projectors, and smartboards. Computer suites are available at secondary schools for pupils to learn computing and other applications such as word, excel, power point... etc. Participants confirmed that other departments are also able to use these suites, if needed, to conduct technology-based lessons or for pupils to search for relevant information to their studies. Furthermore, some city councils have provided teachers and pupils at secondary schools with portable technologies such as iPads and other city councils have provided secondary schools with laptops and Chromebooks that can be used by teachers and pupils in the different department.

**Craig** *“In classrooms, every teacher has a desktop to do the lessons and project them on a screen or a smartboard. There is also a set of 20 laptops at the biology department which means a laptop for each student.”*

Participants confirmed that the availability of ICT encouraged them to integrate it in their teaching practices and to adopt student-centred approaches. They said that they employed ICT in their teaching practices enabled them to provide pupils with interactive learning activities. This, in return, has increased pupils’ level of interaction and improved their learning performance.

**Sameera** *“Smartboard is used in each lesson normally. It really becomes interactive towards the end of the lesson when students are given exercises to answer, and they*

*are allowed to come up to the smartboard and write their answers for the rest of the class to see.”*

They further said that their teaching practices were usually centred around pupils which were productive methods of teaching and learning.

**Nancy** *“Well, the focus in PGDE was mainly about student- led approaches where I should be flexible, sensitive, and to adapt and respond creatively to different teaching and learning situations according to the nature of the lesson and students’ characteristics. I use these approaches every day. I always listen to my students and respond to their queries. In terms of learning intentions, I make them not vague but like open. I teach them how to create and master tone and articulation in their own way and be happy learning this.”*

Participants also confirmed that integrating the smartboard in their daily teaching practices has helped their pupils improving their understanding of the important concepts of the subject content and not merely recalling them. They further said that the integration of the smartboard into their teaching practices enabled them to increase their pupils’ engagement which in return has made pupils feel they are active agents in their learning.

**Sameera** *“I start the lecture by rehearsing what they have learned the day before. Then teaching something new such as doing an experiment, that’s students’ activity, and then there would be a discussion or doing questions. So, it is about actively and physically engage students in their learning to understand what the lesson was about and to make them happy about the class.”*

Findings showed that participants usually allowed their pupils to use ICT to conduct various learning activities. These activities have helped them to cooperate with each other to solve problems, discussing the proper answers/solutions to motivate their critical thinking.

**Marlyn** *“I can say that the use of the smartboard helped me showing them how to do the task and direct them to do it properly and in the correct order. Once we made a step, they tested it and check if it worked properly. Kids were very happy because of their success and everyone in class was able to see the programme works.”*

Portable technologies were also available at secondary schools. Some teachers and pupils were able to use iPads while others used laptops and /or Chromebooks in the classroom activities. Participants recognised iPads as a further step towards improving teaching and learning. They said that iPads has enabled pupils to overcome time and place boundaries.

**Nancy** *“That is why they brought the iPads because they are really handy, and students can use them while they move between classrooms, and they can take them home and get access to what they need at home.”*

Participants recognised that the provision of iPads have provided pupils more freedom in structuring their learning. They said that iPads have motivated pupils to improve their level of engagement in learning and increased their interaction with peers and teachers.

**Sameera** *“I think with the introduction of the iPad, students are leading their learning a bit more by being more responsible for their own learning and more engaged in their learning. Students could do much with the iPads like searching something up or doing a quiz online. It also helps low level students to do exercises and homework in their own pace. So, I think students became more confident in their learning skills, researching skills and been able to extract information.”*

Participants also asserted that the use of iPads has enabled them to increase their pupils’ level of engagement in their learning. During school time, pupils were able to use them to develop their learning outcomes either by practicing virtual exercises, answering online quizzes, and improving their research skills by searching online for relevant information.

**Rehana** *“The main differences between iPads and smartboards are that iPads personalize learning to students. This means when kids use iPads, they can break down the barriers and become more confident while learning. kids can adapt their learning and can create what they want to create. They really can help in their engagement when they feel they have their ownership over their lessons.”*

iPads, as confirmed by participants, also improved pupils’ individual learning needs, increased their self-confidence, and developed their digital skills. Pupils with learning difficulties were also able to learn at their own pace and avoided embarrassment.

**Olivia** *“Yes, I think it would particularly for certain lower abilities students. It will give them an opportunity to use different resources particularly online resources in order to build their confidence with the subject. I am sure it would be used too by higher abilities students as well, but just from my own personal experience I think it would benefit those lower abilities students particularly.”*

The number of pupils at classrooms did not form a barrier that could hinder participants from delivering meaningful learning experiences. Findings revealed that the regular classroom capacity in Scotland was twenty pupils and a maximum of thirty-three pupils in limited cases. Participants asserted that they were able to manage their classrooms even with the highest number of pupils (i.e., 33). Participants confirmed that they depended on various factors in managing the classroom. These factors were about pupils’ plans for their future professions, their level of engagement in the classroom activities, and how they perceived the ease or difficulty of the subject they study. Participants confirmed when the number of pupils exceeded twenty, it was a bit difficult for them to manage it. Their concerns were mainly about providing every pupil with care and to make sure that no one left behind.



**Rehana** *“Twenty is significantly better than thirty which is a challenge to meet students’ needs who need massive amount of support to access class facilities and 30 is a very big number to meet all their needs and it requires huge amount of planning to know all the young people and to make sure that you have extension tasks ready.”*

Participants believed that when pupils were engaged in their study activities, they were able to manage their challenging behaviours. Participants also confirmed that as long as pupils were eager to learn more of the subject, they spent less effort on managing the classroom.

**Olivia** *“This year one of my classes had thirty-one students and they were all very well behaved, all eager to learn in math and a lot of them selected math as a subject. So, for me their behaviour management and classrooms management were very straight forward.”*

Participants recognised pupils’ perspectives of their future careers as a further factor in classroom management. Sameera said that she was able to build up a robust relation with her pupils and managed the classroom properly because pupils recognised the importance of the subject to their future.

**Sameera** *“I think as long as I have good profession expectations for students and they also have the same good profession expectations and are aware about the consequences if they do not follow the teacher’s expectations, the class then is manageable.”*

Findings also revealed that the monitoring App was one of the available applications on the iPads that have also enabled participants to manage classrooms properly. They said that this feature has enabled them to monitor their pupils’ engagement in the classroom activities, avoid disruption, and prevent access to any improper websites or materials.

**Nancy** *“Once, everybody signs in I have a dashboard on my iPad where I can see their names and I can see what Apps they are using. I can see if someone is using another App or google something. I also have the feature to freeze them all if I want them to listen to me or to display something on board.”*

Participants also confirmed that they employed the monitoring App to motivate their pupils and attract their attention by displaying activities directly either to their iPads, the desktop screen or the smartboard.

**Marlyn** *“We also have a monitoring system which is a software on the teacher desktop to let the teacher look at what are students doing on their computers. So, I can zoom in on my screen to see. Also, I can put a lock so that they cannot go on to the internet. I can demonstrate things directly from my computer directly into their monitors so that they can see what I am doing if I want to demonstrate something to them.”*

#### **4.2.2 Subtheme Two: Beliefs and Attitudes**

Findings emerged from this sub-theme explained how and why participants formed their attitudes and beliefs about the advantages that ICT integration can bring into their pedagogical practices.

##### **4.2.2.1 Egyptian Context**

In Egypt, findings revealed that participants formed their beliefs and attitudes towards ICT integration over two stages. The first stage was during “Manahel Al Maarifah’s project and the other stage started with the introduction of interactive boards into classrooms and the *tablet* project. Findings showed that “Manahel Al Maarifah” project was the first attempt for the MoETE to provide schools with educational technology in the 1990s. The goal of the project was to provide intermediate and secondary schools with multi-media suites that are

equipped with an overhead projector, desktop computer, satellite TV, wall- mounted display screen, and a videoplay recorder. This project aimed to familiarise teachers and pupils with educational technology and the potential role of these technologies in the development of teaching and learning.

Participants said that “Manahel Al Maarifah” did not develop their pedagogical practices significantly or build positive attitudes towards the integration of ICT in their teaching. The project also did not enable them to form a belief that these tools could enable them to provide pupils with better learning experience. They said that it was not practical to have one multimedia suite available for the whole school to use. The limited time slots, class management, and the tight space of the suite compared to number of pupils did not encourage participants to use the “Manahel Al Maarifah” suite regularly.

**Faten** *“The school has Manahel Al Maarifah which is a multimedia suite. There is a desktop computer to run CDs for pupils to watch a movie or listen to some audio material. But due to overpopulated classrooms, it was difficult for me to use it. I can say that the number of times I used it was very limited if not rare.”*

Furthermore, during school placements, participants did not have the opportunity to use this room as well. They had only the chance to practice teaching in traditional classrooms that did not have any type of technology tools at that time.

**Sawsan** *“During school placements we were trained in the traditional classrooms. We never had the chance to practice teaching in Manahil Al Maarifah.”*

In contrast, findings showed that the introduction of interactive boards into classrooms at secondary schools had a positive effect on participants’ beliefs and attitudes towards ICT integration. Participants believed that the availability of educational technology

tools in the classroom has strongly supported their beliefs in the significance of integrating ICT into their pedagogical practices. They perceived the introduction of interactive boards was a progressive step towards digitising their teaching practices. They were optimistic that this step would enable them to implement constructivist teaching and learning approaches to increase pupils' engagement and enhance their academic achievements. They asserted that they were using the smartboard on daily basis to deliver the lessons content in a more attractive way than traditional methods. For them, the interactive board became an essential tool that they employ in their daily teaching practices. They further contended that this regular use of interactive boards has increased pupils' attainment and enhanced their academic outcomes.

**Hassan** *“Recently interactive boards have been provided in classes at secondary schools through which I can present and explain lesson content better through power point or any other means. Also, I use the internet to access search engines and search for materials available on the internet that can help me explaining the subject content in a better way. I have also noticed the positive effect of these tools on how well pupils understand lessons.”*

They said that the availability of ICT technologies in the classroom strengthened their beliefs in the positive effects of ICT integration on pupils' learning performance. They also said that their use of these tools strengthened their beliefs that the audio and visual features of these tools have helped them delivering the curriculum in an interactive way better than traditional teaching and learning styles.

**Saeed** *“When I used the interactive board technology this year, I found it useful in teaching. I also noticed that pupils' interaction increased. Also, my colleagues used it*

*and were encouraging and urging pupils to use technology and showing them how important it is and how it can help them understanding lessons easily.”*

However, overcrowded classroom was one of the factors that has compelled participants to decrease their aspirations about the capabilities of ICT and even form negative attitudes towards them. They perceived overcrowded classrooms as a time and effort consuming factor. They claimed that they take long time to manage the classroom and avoid damages to any of the classroom assets (i.e., desks, the interactive board... etc). They asserted that pupils in this age tend to show disruptive behaviour and, thus, classroom management was for them distressing and demanding.

**Sawsan** *“I have forty pupils in the classroom. I believe that ten pupils are enough for each teacher. This offers me the chance to address their learning needs. The crowded classroom are not easy to manage, and I feel I cannot deliver teaching properly.”*

Participants said that this issue forced radical changes to the setting of the classrooms. Classrooms were arranged into tight rows that did not provide enough space for participants to conduct learning activities. Whenever they tried to use the interactive board to conduct creative learning activities, they were only able to select very few pupils to do these activities while the rest could rarely have a chance to take part in these activities. Therefore, these overcrowded classrooms did not enable participants to support pupils’ individual learning needs. Participants were forced to employ the interactive board as a mere replacement to the traditional tools (i.e., board and chalk) to deliver as much of the lesson content in a short period of time to avoid missing any parts of the curriculum.

**Mahmoud** *“It is difficult to use the interactive board because of the high density in the classrooms, which makes it difficult to control the classrooms and control the behaviour of pupils and the lack of sufficient space for the teacher to move between*

*rows to observe what they are doing or follow their participant in the class activities.”*

Findings also revealed that the *tablet* formed the second factor that affected participants’ believes about ICT integration. Participants did not show the same enthusiasm towards the *tablet* project as they have done towards the interactive boards. They asserted that the *tablet* would have been of a remarkable success if it was planned well. They said that limited access and deactivation of several Apps and other learning features of the *tablet* did not help them to build positive attitudes towards the potential advantages of this tool.

**Wael** *“I do not use the tablet in teaching as it is not possible to link it to the interactive board although I can link pupils’ smart phones to the board. Through this link, I noticed a great interaction of pupils with me, and I believe if these features were available on the tablet, it would increase pupils’ confidence in the tablet as an effective educational device.”*

Participants asserted that the *tablet* would have been a remarkable educational tool if its interactive features and learning Apps were activated and connected to the interactive boards. They said that this type of portable technology would have helped them adopting communicative teaching and learning approaches and enable pupils controlling their learning.

**Kamal** *“There are still some features that are not activated on the tablet now, and if they are activated in the future, pupils can be encouraged to do research projects or create videos to show their creativity.”*

They said that the limited access to these features and Apps formed a barrier for them to integrate the *tablet* into their pedagogical practices. They also contended that these features would have enabled them conducting visual simulation of scientific experiments, math

exercises, topography, computer games and language proficiency exercises if they were active and accessible.

**Anwar** *“I do not use the tablet to present the lesson content because the smart board has better properties than it. The main purpose of the tablet right now is to access the Egyptian knowledge bank (EKB) and download textbooks or watch and download further supplementary materials that explain the content of the subject. In addition, pupils use it to perform final exams.”*

Training courses formed the third factor that participants perceived as a barrier for them to form positive attitudes towards the significance of ICT integration in their pedagogical practices. Findings revealed that participants have received several training courses about the use of interactive boards, however they confirmed that most of these courses were theoretical. They said that during these courses they only knew the components of the interactive board but could not accumulate sufficient knowledge about how to practically employ the features and Apps in the teaching and learning activities.

**Mahmoud** *“The problem lies in the quality of the training and the way it is managed. Most of these courses were very theoretical and delivered by inexperienced trainers. We were trained how to use the smartboard, but the training was theoretical and there was not even a smartboard in the training venue to understand how it works in a practical way.”*

Some participants did not recognise this factor as a restricting barrier for them to master the use of these interactive boards. Therefore, they searched for alternatives to gain enough knowledge about the use of interactive boards. Some of them, for example, received help from experienced teachers while others searched for self-learning methods such as tutoring videos on the internet.

**Wael** *“I searched the Internet for videos that explain how to use the smartboard and its features, then I applied this knowledge in the class with the help of the IT department specialist at school who provided great support to me and all other participants.”*

These course also did not provide them with sufficient knowledge about how to handle the malfunctions that may occur while utilising it. Therefore, they said that these courses have negatively affected their attitudes towards the efficient role that ICT integration can play in developing the teaching and learning practices. They asserted that if the MoETE continues providing them with training courses that are irrelevant to ICT integration, they may develop a resisting attitude towards ICT integration into their pedagogical practices.

**Yassin** *“The ministry should provide high-quality training for some teachers who must then train other teachers at different schools. This solution is proposed due to the lack of sufficient number of trainers.”*

#### **4.2.2.2 Scottish Context**

In Scotland, findings showed that secondary school teachers formed positive attitudes and beliefs towards integrating ICT into their pedagogical practices. Findings revealed that the availability of ICT, the number of pupils at the classrooms, access to learning Apps, and training courses were motivating factors for them to form their positive attitudes towards ICT. Findings also showed that most classrooms at secondary schools in Scotland accommodate a maximum of thirty-three pupils. However, educational authorities have decreased the number of pupils to twenty in the classroom at most secondary schools around the country for health and safety reasons. Participants asserted that they have experienced teaching a higher number of pupils in the classroom on limited occasions.



**Sameera** *“As a science teacher we can only have a maximum of twenty students. We cannot have more than twenty because it is a practical class setting for experiments and we cannot have more than twenty for safety.”*

Participants said that twenty pupils in the classroom was an ideal number for them to manage, avoid loss of time to register, and make use of the class time efficiently. They further said that this low number of pupils in the classroom has enabled them to manage any unexpected behaviours and has also helped them to engage pupils in the different learning activities.

**Nancy** *“It is normally between twenty to twenty-five students. There are hundreds of factors that affect how students behave. But if they are all working and if teacher has the classroom all set up, it can be manageable because you know who is actually doing the work.”*

Participants also confirmed that this number of pupils has enabled them to perform various learning activities. These activities have increased the level of interaction between pupils and teacher and with their peers as well. They also have enabled participants to provide pupils with equal learning opportunities, supporting each pupil individually, and helping low-level pupils or those having learning difficulties to cope with their peers.

**Marlyn** *“I have twenty students in the classrooms which is a good number. I always use the whole class instruction approach at the beginning of the period and then followed by individual going round to help students individually and to see how they are getting on and that sort of thing. Also, it would be nice to do more collaborative group work.”*

The second factor was the availability of ICT technologies in the classroom and the school. Findings showed that most secondary schools in Scotland were equipped with educational technology tools long time ago. Participants confirmed that there were diverse types of ICT

technologies available in the classroom and within the schools as well. They said that classrooms are equipped with a desktop computer, a wall-mounted screen, and an overhead projector long time before the introduction of smartboards into primary and secondary schools.

**Craig** *“In the classroom, every teacher has a desktop to do the lessons and project them on a screen or a smartboard.”*

Participants said that they formed positive beliefs and attitudes towards ICT integration in pedagogical practices early during school placements. They said that they were able to practice using ICT tools such as smart boards, desktop, and overhead project in addition to portable technology such as iPads and laptops/Chromebooks during school placement.

**Olivia** *“I have been very lucky to still be employed at the same school of placement on permanent basis. In the Mathematics department certainly, they had BenQ boards which are interactive touch screen boards that I can use. There were also a couple of class sets of laptops available at support for learning department and you can request the use of them.”*

Furthermore, the daily use of these tools in their teaching practices, strengthened their beliefs about the importance of integrating ICT into their pedagogical practices. They said that the continuous use of these technology tools over different times has formed their positive beliefs about the potential effects of ICT on the development of their pedagogical practices.

**Nancy** *“It is part of being a teacher is using the best technology and the best tools at your ability to enhance students’ learning as that is what going to get them prepared for future and be confident in learning.”*

They were confident that the various features of ICT would enable them to deliver their teaching practices in a better way and would also enable them to engage pupils and support the development of their academic performance.

**Rehana** *“I think the way of ICT at school now is so much more rather an add-on to learning to so much more to be part of their learning and more like a massive part of how they learn and how they can show their understanding.”*

The availability of ICT tools was not the main reason for teachers to form positive beliefs and attitudes towards ICT integration but the availability of active several features and educational Apps on the ICT tools. They confirmed that these feature and Apps improved their teaching practices, and they tended to employ pupil-centred approaches in favour of traditional teaching styles.

**Sameera** *“There is a lot for science experiments, and I use a website called Phet where there is really good stimulation and really good activities that I like to do with students on the smartboard. I let them to either come up to the board and write their answers or watch an experiment.”*

The third factor focused on professional development courses and their effect on participants’ understanding of the role of ICT in education development. Findings showed that it was mandatory for participants to register for specific number of training courses during their probation year to become qualified teachers.

**Craig** *“There are a lot of training available. You could do different courses such as how to support students, mental health of students, IT training courses, training courses of learners of English as an additional language, and many other training courses.”*

Participants said that they were also able to access these courses online or in-person any time of the year during or after school day. They asserted that online courses enabled them to accumulate knowledge about the best teaching and learning practices they could implement with the support of ICT.

**Sameera** *“There are a lot of courses available to learn different things. For me, it is usually technology that I learn to just get better at using it effectively to teach students and also, I usually take courses about how to become better in the course content and how to teach S5 and higher. I have taken a lot of courses in education. So, I am now fully trained in how to use educational Apps.”*

Findings showed that the goal of professional development courses was to strengthen their knowledge about the significance of ICT integration in their teaching practices and how it can improve pupils’ academic outcomes. They perceived the significance of these training courses in accumulating knowledge about the contemporary trends in teaching and learning locally and internationally. They asserted that these were training courses that trained them on different aspects of teaching and learning. Thus, they formed positive beliefs and attitudes towards employing ICT in different learning activities in the classroom.

**Rehana** *“There are different training courses in every aspect of teaching. You can do training course in behaviour practices, effective questioning, how to use Pages or Keynotes or how to use different educational Apps on the iPad. There are also different types of training courses of pedagogy such as Higher order thinking skills, effective questioning, effective feedback, assessment arrangements and other various pedagogical courses.”*

### 4.2.3 Subtheme Three: Confidence

Findings from this subtheme discusses the effect of self-confidence on participants' intention to employ ICT in their teaching practices. Confidence refers to the level of individuals' trust in their technology skills and their ability to utilise ICT in their pedagogical practices. The level of self-confidence encourage ICT users to use their talents and the ICT skills they have developed to improve their job performance.

#### 4.2.3.1 Egyptian Context

In Egypt, findings showed that participants formed strong intention to use ICT in their teaching practices. Though they did not receive proper training about the use of technology in teaching and learning during their initial education, they were confident that they can integrate ICT in their future teaching practices. Also, the use of interactive boards and tablets for teaching and learning gave them more confidence in their technological skills. They confirmed that they were able to employ various ICT tools such as interactive boards and tablets in the classroom and their teaching practices improved significantly. They also said that their desire to employ more constructive ICT teaching approaches has improved their confidence in their technology skills. They also believed that the advanced features of ICT technologies have improved pupils' learning outcomes.

*Saeed "Before having the interactive board in the classroom, I noticed that pupils were distracted, bored and even some of them might even sleep during the class because I was using the traditional teaching method. Once this interactive board was available in classrooms, pupils' attention increased."*

Findings showed that the regular use of personal technology tools was a motivational factor for many participants. This issue has increased their confidence in their ability to use the educational technology tools efficiently. Those who used to use technology became familiar

with educational ICT tools and were able to employ them in their teaching practices. They felt confident to employ interactive boards and tablets with little effort and away from being stressed. Their confidence helped them to consider the role of these innovations in the development of pupils' level of engagement in classroom activities.

**Faten** *“Almost since I was young, I had a personal computer at home. I used it continuously and learned a lot about applications such as Microsoft Office’s Word, Excel, PowerPoint, and educational computer games. When I started my teaching profession, I used to use my personal laptop and smartphone to enable pupils to benefit from the advantages of technology in education.”*

Findings also showed that professional development affected some participants' confidence in their technology skills. They said that they have received different training courses about educational technology and its role in developing education. They asserted that these training courses improved their ICT skills, and they felt confident in their abilities to employ educational technologies.

**Anwar** *“The current courses are distinguished as they we are trained on how to deal with pupils, how to use modern strategies for learning, how to use the tablet, and how ICT fit into the modern education system. They also focus on developing the teacher’s teaching capabilities.”*

Other participants said that these courses increased their confidence in their ability to support other teachers at school and convince them to use ICT in their teaching practices. They said that they began to conduct training courses at school to transfer their knowledge to their colleagues who were hesitant to use ICT and those of low confidence at their ICT skills.

**Rashad** *“From my personal experience, through continuous training that I have conducted within schools, I was able to convince many teachers who were hesitant to use technology. Right now, they are using it effectively.”*

On the other hand, findings revealed that participants have noticed that some of their teacher colleagues were reluctant to integrate ICT. They said that those reluctant teachers have adopted an extreme view and believed that they had enough experience of the subject matter they teach and, thus, they did not need to integrate ICT. They said that they were confident in using traditional teaching approaches and did not feel they should use any of the ICT tools in their teaching practices.

**Safwat** *“There are older teachers who face difficulties in dealing with technology and those teachers represent 90% of the educational staff at secondary schools right now. Technology for most of them is very difficult and even almost impossible to learn about it. They have developed personal beliefs that it was too late for them to learn about modern technology or use it in teaching. Therefore, they always prefer traditional teaching methods.”*

Participants said those reluctant colleagues raised their concerns about factors they perceived as possible barriers that could affect their confidence in ICT integration. These concerns were about their low level of self- confidence in technology skills and their fear of inability to adapt with these recent changes. They expressed their doubts about the significance of ICT and its role in developing their pedagogical practices. They raised the age issue as a valid reason for them to resist ICT integration. They felt that they were old enough to integrate ICT and it, only, suits younger teachers. They insisted that they were not able to learn how to use technology and if it was necessary for them to learn, there was not enough time for them to do so as they were going to retire very soon. Therefore, they resisted to attend training

courses that could have helped them to know how to use these educational technologies and even rejected to receive any help from other teachers at school.

**Yassin** *“The problem is that older teachers do not accept these courses, and if they attend, they do not give much attention to what is presented at the course because they do not accept the idea in the first place.”*

Surprisingly, participants said those reluctant teachers have employed ICT in their teaching pedagogies during the COVID-19 pandemic. They looked for all possible ways to understand how to operate and use the various educational Apps, smartboards, and portable technology as well. They were able to overcome their doubts about their inability to integrate ICT and became more self-confident in using ICT. Participants said that these drastic changes happened due to those reluctant teachers’ personal need to avoid losing private tutoring which was an additional source of income second to their income as secondary schools teachers.

**Meena** *“When the Corona pandemic occurred, I noticed that many of those teachers who were reluctant to use technology did not hesitate to use it to avoid losing private tutoring. Technology for them was an effective tool they employed to communicate with pupils and a life saviour that secured their second source of income. They even excelled in using many of the educational Apps such as Zoom and Google classrooms.”*

#### **4.2.3.2 Scottish Context**

Findings from Scotland showed that participants’ personal experiences in employing ICT have enhanced their technology skills. They said that these experiences improved their level of self- confidence in using and integrating ICT in their pedagogical practices. They confirmed that they practices using ICT technologies since they were pupils. Different



technology tools, such as desktops, smart/interactive boards, laptops, and iPads, were available for them to use in the classroom. At universities and during school placements, they had further opportunities to gain more experience about how to employ ICT in teaching and learning activities.

**Craig** *“I believe I started to use technology when I was a teenager, or probably before that, during early to middle primary schools. We had desktop computers that we practiced typing on them. When you do the PDGE, you do get some training, and you can get more training. It is mostly about the use of a smartboard.”*

Findings revealed that these early experiences have strengthened participants’ confidence in ICT and its vital role in developing their teaching skills. They further said that they have recognised how the utilisation of these technologies has improved pupils’ academic performance.

**Rehana** *“Technology definitely does make the big difference making sure that you as a teacher can support learners who need more support and push on the learners who need to be pushed. It gets kids engaged by letting them choose their tasks and by giving them a lot more freedom to choose their tasks and how they want to show their learning. Kids are more ready to engage more when they feel they have a lot more ownership of their learning.”*

Professional development was another factor that have affected participants’ level of confidence. They said that they have received various training courses during their tertiary education and after they have joined the teaching career. They said that these training courses were mainly about the use of smart boards and overhead projectors in delivering the lesson content. They said that these training courses enabled them to practice using these tools in classroom comfortably and thus their self-confidence in their technology skills has improved.

**Marlyn** *“I took one course in my subject area and also some training courses about how to use the library to understand the proper referencing. I took an online one-hour training programme at the university about how to use smartboard, and it was quite useful.”*

During school placements, participants have also received support from head teachers who helped them to operate and use ICT in the classroom for teaching and learning.

**Olivia** *“I was shown on my first day the different ways to use the smartboard. It was not just my mentor. I think the department, as a whole, were really good and showed me the different ways, I could make the most of the board. So, once I was shown how to use it, it was clearly straight forward.”*

When the iPad initiative was implemented at many of secondary schools, participants said that they have received training courses about how to employ the features and Apps available on the iPads.

**Sameera** *“I have taken a lot of courses in education provided by Microsoft. So, I am now fully trained in how to use Microsoft educational apps. I also got a course about Apple teacher once we received the iPad.”*

Participants also confirmed that iPads had loads of useful features and apps for both teachers and pupils. They said the utilisation of these features and apps has enabled them to increase pupils’ level of engagement and even extended their support to pupils after school as well.

**Nancy** *“They have core applications like Pages and keynote in addition to Microsoft educational applications like Microsoft Teams, Showbie, and other fun educational Apps. For me, the biggest difference is students’ ability to develop their creativity skills as well as the composition of work. That is, they brought the iPads because they*

*are really handy, and students can use them while they move between classrooms, and they can take them home and get access to what they need at home.”*

Findings also revealed that some of the participants colleagues were reluctant to use or integrate technology into their teaching practices. Participants confirmed that though those reluctant teachers were confident in their teaching experience and perceived it enough for them to deliver the subject content without employing ICT technology in their teaching practices.

**Sameera** *“A lot of older generation would just teach from the white board or just speak to students. They were definitely less interested in using technology. I think that is obviously because this way is working for them, and it is human nature that do not change something if it is still working.”*

Some participants also said that reluctant teachers resisted to change because they used to receive help from other colleagues and, therefore, were not concerned to develop their technology skills.

**Olivia** *“I had a conversation recently with a member of staff who has been a teacher for several years and does not even know how to make a power point. She had to get a colleague to do this for her. She was not keen to know or willing to do things herself. She was quite happy with them to take it over and not interested to do it herself.”*

Participants said that those teachers were reluctant because their level of confidence in their technology skills was low. They were not sure they could utilise ICT technology in their teaching practices and believed that technology suits younger teachers only. They further said that those reluctant teachers resisted to change because they do not trust technology’s potentials in developing education.

**Rehana** *“There are teachers who struggle because they are reluctant to use technology. Technology specialists at school can help them build confidence to overcome their reluctance by encouraging them to observe other teachers when using technology in their classes and try using technology tools to see its potentials in teaching and learning.”*

Participants said that those reluctant teachers had low level of confidence and always focused on the downsides of ICT and ignored the significance of technology in developing teaching and learning. They assumed that learning how to use technology required various skills that they do not have.

**Patrick** *“My perspective idea that the way I use technology works very well for me, but that does not mean it would work well for my colleague next door. This is about teacher’s ability and confidence in using technology, the more able, the more confident they are in using ICT, the more they will use it. I am taking a fair guess that a lot of teachers think that they are not using ICT because they feel that it requires skills to use it.”*

## **Summary of Theme Two**

The importance of pedagogical practices is that they can enhance the overall quality of teaching and learning. The term of pedagogical practices is a broader term that is not limited to how teachers teach. It covers the teaching methods/approaches, learning activities, and the educational technology teachers employ in their daily teaching practices to deliver the content of a subject. Pedagogy practices enable teachers use ICT into their teaching approaches to deliver interactive learning activities that suit pupils’ individual learning needs (Das, 2019; Altun, 2019; Ginsburg & Megahed, 2021). They refer to the teaching approaches adopted by teachers and their beliefs and attitudes towards ICT integration in their teaching

practices. They define teachers' knowledge of the subject matter content, the way they assess pupils' learning capabilities and academic performance. Furthermore, they define teachers' ICT skills and the level of their confidence in using technology to deliver better teaching practices (Bai et al., 2016).

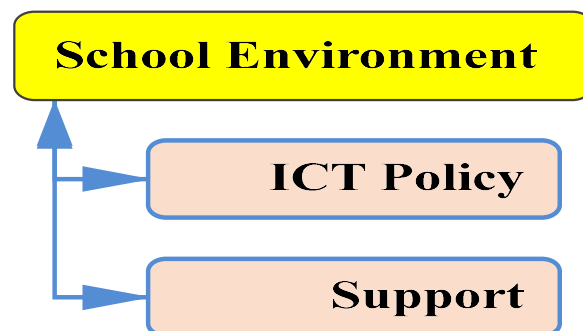
Findings of this theme discussed the effect of participants' confidence in their technology skills and their beliefs of the effect of ICT integration on their teaching approaches. Findings revealed that participants in Egypt and Scotland recognised the significant role of ICT in developing their pedagogical practices and enhancing pupils' learning experiences. Participants said that integrating ICT into their pedagogy practices was fundamental to digitise secondary education, enhance their teaching capabilities and increase their self-efficacy. They confirmed that incorporating computer-based digital technologies into curriculum enabled them to fulfil pupils' learning needs and improve their cognitive skills such as problem-solving and higher-order thinking skills. Nonetheless, findings revealed that while participants from Scotland were able to integrate ICT effectively in their teaching practices, their counterparts in Egypt encountered some factors that formed barriers to implement ICT in their teaching practices.

In Scotland, the continuous provision of relevant training courses, the availability of various ICT tools in the classrooms, and the low number of pupils in the classroom were motivating factors for participants to recognise the significant role of ICT in developing their teaching and learning experiences. Classrooms were not crowded with pupils and there were enough ICT tools for both pupils and teacher to use. Therefore, participants were able to employ ICT into various teaching and learning approaches that are suitable for different learning activities. The integration of ICT into these learning activities have increased pupils' engagement and promoted their creativity and critical-thinking skills and provided pupils with learning experiences that are meaningful. On the other hand, participants from Egypt

were enthusiastic to employ ICT into their teaching practices but there were barriers that hindered them to fully integrate it. Participants had to work in overcrowded classrooms which limited the opportunity for the majority of pupils to take part in the learning activities they conducted on the interactive board. The available professional development courses were mostly irrelevant and focused on theory in favour of actual practices.

### 4.3 Theme Three: School Environment

Findings of this theme and its subthemes explored the effects of ICT policy and technical support on school environment and how they could affect teachers' experiences in integrating ICT. The below figure represents the theme and its sub-themes.



*Figure (9) Theme Three*

#### 4.3.1 Subtheme One: ICT Policy

This subtheme discusses the role of ICT policy in facilitating the required resources for ICT Integration in education. It explores the implementation mechanism followed in Egypt and Scotland and its effect on teachers' experiences in integrating ICT in their pedagogical practices and its significant role in education development.

#### 4.3.1.1 Egyptian Context

Findings from Egypt showed that the MoETE's declared vision about providing interactive boards in classrooms was to enable teachers to develop their pedagogical practices and enhance pupils' learning outcomes. Participants said that they perceived the introduction of interactive boards in classrooms a crucial step that could support them in adopting educational technology in their pedagogical practices.

**Meena** *"Currently, there are smart boards in the classrooms, which have become a great substitute for Manahil Al Maarifah- the multimedia suite- that had few computers. But now the availability of smart boards in the classroom helps me to use technology more."*

However, participants perceived that schools' digital infrastructure was affected by factors such as number of computers available for pupils to use, internet connection, the limited access to various educational applications on these tools, and technical support as well. They perceived that these factors affected the successful integration of ICT.

**Kamal** *"The internet connection is not as strong as it should be. Interruptions occur due to poor internet connection. This is due to the considerable number of computers, tablets and phones for pupils, teachers and the school administration that connected to the school internet connection."*

Participants said that the inappropriate implementation of ICT policy has affected the integration of ICT at secondary education. This issue resulted from the lack of correlation between the national curriculum at secondary education and the proposed type of final electronic exams.

**Saeed** *"Pupils always complain that the curriculum content is not related to the type of final test questions. Previously, tests relied on direct questions that*

*require memorization and indoctrination. Currently, electronic tests try to measure pupils' comprehension of the content. These tests are far from the reality of the approved curriculum and the design of questions in the exercises of the textbook .”*

Findings also revealed that bureaucratic procedures have negatively affected participants' experiences of ICT integration. They said that they were willing to integrate ICT in their teaching practices and employing technology to prepare lesson plans and power point presentations at home even this was an extra burden for them. However, they said that though MoETE declared its vision to digitising secondary education and reduce paper work, school principals, head teachers, and subject supervisors still insist that paper work is the main assessment tool of teachers' performance. Therefore, participants were obliged to abide by these rules and prepare manual lesson plans to avoid disciplinary actions against them.

**Mahmoud** *“The use of interactive board in teaching has become an additional burden to teachers rather than a facilitating tool. Every day after school, I should prepare two things, a power point presentation and a manual plan for each lesson. School principals and supervisors insist that every teacher should have these two elements ready, or they will take a disciplinary action against any teacher if we fail to do this.”*

Another factor that findings revealed was related to participants' experiences with the “tablet.” Participants said that they were expecting that they would be able to integrate this type of portable technology into their teaching practices. They expected that the tablet would help them to overcome congestions in the classroom and adopt more modern teaching approaches. However, they said that the MoETE limited teachers and pupils access to specific websites.



**Rashad** *“The tablet has limited access for teachers and pupils. They can access the official website of the MoETE , the Egyptian Knowledge Bank, the Edmodo educational platform, the testing platform for pupils and the test correction platform for teachers.”*

Participants contended that the limited access imposed on the tablet Apps restrained the integration of this portable technology into classroom activities. They said that if these restrictions were not in place, they would have employed the tablet into their teaching practices.

**Wael** *“I use the interactive board to teach but I did not use the tablet yet because there is no connection between my tablet and pupils’ tablets. For example, the interactive board has a programme that links it to pupils’ smart phone devices. Through this connection, I noticed a great deal of interaction while I present the lesson. I believe that if this feature is available on the tablet, it will help increasing their interaction and convince them of the importance of the tablet as an educational device.”*

Participants contended that the MoETE has also limited the role of the *tablet* in education to a mere electronic platform pupils can use to access final exams online. This issue has restricted teachers and pupils’ ability to benefit from the innovative features of this portable technology tool in teaching and learning.

**Safwat** *“I can say that the goal of the tablet so far is for pupils to use it to sit for mid- and end-of-year exams. Therefore, pupils use the tablet for personal purposes such as watching YouTube, movies, and social networking sites or games rather than using it for their education.”*

Participants also said that the MoETE ICT should consider extensive review of the current secondary education system and the mechanism of implementing ICT policies in it. This issue should lead to extensive review of the current curriculum at secondary to help teachers and pupils benefiting from ICT innovations.

**Faten** *“MoETE should change their current view of the education system. The goal should be developing quality curriculum that supports creative critical thinking and not rote learning. I believe that the success of the current experience of integrating technology into education begins first with the development of curricula through the imposition of virtual educational activities within the classrooms to stimulate pupils’ critical and creative thinking instead of relying on memorization, indoctrination, and training of teachers in that way to ensure better chances of success.”*

#### **4.3.1.2 Scottish Context**

In Scotland, findings revealed that the Scottish government’s vision of ICT in education was to enable teachers and pupils to benefit from the advantages of educational technologies in their teaching and learning. Participants said that to implement this vision, Councils have provided schools with different ICT tools such as desktop computers, laptops/Chromebooks, and iPads. They said that this vision aimed to ensure that ICT can help teachers developing their teaching practices and raising pupils’ level of engagement to enhance their academic outcomes.

**Patrick** *“The council I work with, have invested a lot of time and money in a whole range of Google software that are available for students and teachers on their Google Chromebooks that were supplied by school. On these Chromebooks, each teacher and student have their Gmail address for communication. So, it is really good.”*

Participants said that these technologies were functioning efficiently due to the well-established infrastructure provided by the Councils. They contended that the internet connection and access to servers were constant and enabled them to conduct various learning activities that engaged pupils in learning and improved their performance.

**Craig** *“It is a broadband connection that is reliable as it never really cuts off. So, you have always got internet. I make quite a lot of power point presentation to present lesson content. I also use Kahoot which is an online game- based learning platform.”*

Findings also revealed that portable technology was part of the ICT policy adopted by the Scottish government. Councils around Scotland provided schools with different portable technology tools. Some Councils provided schools with laptops/Chromebook for teachers and pupils to use at school. Other Councils provided iPads as a type of portable technology that teachers and pupils can use during school day and at home as well. Participants said that they used these portable technologies in developing their teaching practices and adopting more constructive learning approaches. They confirmed that these tools have helped pupils’ to develop various learning skills and learning more effectively.

**Rehana** *“So, I have my own iPad for school which belongs to the council, I have a desktop computer, a projector, and a smartboard. Apple TV is available on the smartboard to project the iPad screen. I also have remote keyboards that students can plug to their iPads to help them type easily. I use mainly Microsoft Teams, where I can make virtual classroom and I put all the lesson resources that kids need so they can see the whole lesson in front of them, a way that helps some of them to learn at their own pace.”*

Participants who have received iPads asserted that they used them in their daily teaching practices. They said that the use of iPads enabled them to adopt more modern teaching methods. They asserted that the availability of various educational apps on these iPads has helped them to present the lesson content in an attractive way and supported their pupils to improve their creativity.

**Nancy** *“It has meant that I am not stuck at the desktop. If I want to type something with the kids or even like I am moving around the room and want to send a quick email or to find out something quickly, I do not have to keep going back to the desktop at the corner of the room. I like also that I can split the screen and record them. I like also using a variety of different tools and give them instant feedback on things.”*

#### **4.3.2 Subtheme Two: Support**

Findings of this subtheme discussed the technical support available at secondary schools in Egypt and Scotland and its effect on participants’ pedagogical practices.

##### **4.3.2.1 Egyptian Context**

Findings revealed that there were support technicians at secondary schools to manage trouble shootings and malfunctions that participants may face while using the interactive boards and tablets. However, findings showed that majority of those support technicians did not have the sufficient technical background or knowledge to offer professional technical support to participants.

**Mahmoud** *“They were not familiar with computers and other technological devices. They used to work at administrative jobs then the local administration appointed them as ICT maintenance technicians without prior knowledge in this field.”*

Participants said that teachers of information technology (IT) at secondary schools used to provide them with technical support although they have teaching responsibilities. The major software and hardware malfunctions of the interactive boards and the *tablet* were handled by the central IT department of the regional educational directorate and/or the manufacturing company that provide ICT tools to secondary schools. Findings revealed that it took the manufacturing company and/or its regional agents long time to manage these malfunctions and did not provide participants with temporary replacement on many occasions. Though there were regional agents for the manufacturing company of the tablet in most of the cities around the country, however their role was only to receive the malfunctioned *tablets* and send them to the company's central offices at the capital city mainly and, in some cases, their offices in few major cities.

**Hassan** *“If the problem is technical and requires repair and spare parts, teachers communicate with the technology development department at the school. The department then communicate with the local educational directorate who contact the maintenance department of the manufacturing company.”*

Findings showed that the MoETE provided secondary schools with internet connection to support the interactive boards and the *tablet* project as well. Schools now either have a broadband or fibreoptic connection in the classrooms and other school premises. Mostly, this type of internet is a type of limited package depending on the budget provided to each school from the local/ regional educational authority.

**Rashad** *“The financial situation of schools hinders the proper use of technology. What I meant here by the financial situation is the school's financial*

*ability to provide a strong and fast internet connection because of the limited budget allocated by the local educational administration.”*

Findings showed that there were wi-fi boosters at schools to connect the interactive boards and *tablets* to the internet. However, internet access was not limited to teachers and pupils, rather it was available to all school staff, visitors. Furthermore, it was not highly protected and can be hacked. Participants said that this issue has affected the speed of the internet connection and functionality of the interactive boards and *tablets* as well.

**Sawsan** *“Internet access is available for anyone. Teachers and pupils use it for the interactive board and the table. We even can use it on our personal mobiles. I can say it was not restricted, so anyone gets the password can use it but now it is limited to school staff only.”*

Findings also showed that quite number of pupils were able to override the firewalls and penetrate the security system of the *tablet*. They were able to install social media websites in addition to games and films websites. Participants said this issue made pupils turn the role of the *tablet* to a game console rather than a tool for learning.

**Safwat** *“The tablet has a security system, but it seems that pupils have hacked it and used it to surf social media, games and/or watching movies. It really distracted their attention away from the lessons. Even many of them were attending school on daily basis to benefit from the free internet at school for joy and not for educational achievement. This has led to a decline in their academic level.”*

Participants said that this issue has affected pupils' engagement as it diverted their attention and made them busy using their tablets or personal mobile phones to access social media, watch films, or play games.

**Saeed** *“Unfortunately, many pupils did not benefit from the tablet as supposed to be and as announced by the MoETE. Unfortunately, many of them have downloaded games and social media which distracted their attention most of the time.”*

#### **4.3.2.2 Scottish Context**

Findings in Scotland revealed that the provision of technical support services varied from one Council to another. Some of the participants confirmed that their schools have an IT department and a support technician available at school. Other participants said that the Council’s IT department was responsible for the technical issues they might encounter while using ICT in the classroom. They confirmed that access to technical support was available for them either through a telephone helpline service or by booking an appointment for a technician to visit their school if issues were not solved on the phone. For critical technical issues, findings revealed that participants used to contact the agent, or the company assigned by the Council to manage these issues. Participants said that though the agent or the assigned company usually provide them with quick and efficient technical support, it took that agent or the assigned company a while to manage major issues or to provide a replacement.

**Craig** *“We have a telephone help line that we can call, and they would try to solve problems online if possible or ask for an ICT technician to solve it. It is very much depending on the issue what it is. But it has been numerous times that they were able to solve it on the phone and that has been excellent. Other times, it requires a technician to come along because something we need to install or uninstall physically.”*

Findings showed that other Councils that have provided pupils and teachers with iPads had a separate technical support scheme. Participants said that Councils made an agreement with

the manufacturing company to provide full maintenance and to replace any damaged and /or broken iPads.

**Nancy** *“Right now, if anything goes wrong it comes to me and then I try to fix and If I cannot fix it that’s when I phone the maintenance company (CGI, and they take from there.”*

Findings showed that all schools had standard broadband internet connection. Participants did not define whether this connection was a limited or unlimited broadband, but it could be assumed that it was the unlimited type depending on the current situation of the internet services in Scotland and the UK.

**Craig** *“It is a broadband connection that is reliable as it never really cuts off. So, you have always got internet. It could be slow sometimes like during lockdown teachers were uploading a lot of stuff online and it made it a bit slow.”*

Participants said that the strength and weakness of the connection differed from one location to another depending on the internet service provided by the council in each city. It also depended on the number of pupils, teachers, the school’s administrative staff and the number of technology tools available in the classrooms and other school premises.

**Nancy** *“This connection could be a bit slow on Monday morning when all teachers connect their smartboards. Sometimes there could be a slight delay when displaying videos but is it fine at the rest of days.”*

Participants said that access to the internet varied from one city to another as well. Some Councils did not limit the access to ICT in the classroom but allowed everyone at school to access the provided internet even on their personal mobile phones and /or tablets.



**Marlyn** *“Everyone at school who has the school login can access it. There are security measurements set and managed by the council, not by school, to track students when using the internet to prevent them from accessing sites with adult content.”*

Other Councils limited the internet access to ICT tools that teachers and pupils use at classrooms during the school day.

**Olivia** *“There is the intranet which is provided by the Council but there is no Wi-Fi. Unless you have one of the school’s issued computers or laptops, you cannot access the internet at the school building. This applies for both teachers and students as they have login details to enable them to access the internet at school.”*

Participants said that the strong security systems on the ICT did not allow access to social media, games, and films websites. They confirmed that Councils provided these technologies with a reliable security system to prevent any breaching of the settings. They said that any attempt to breach the internet settings on iPads or to use the Council’s internet access on personal technologies was prohibited. They further confirmed that any breaching would result in disciplinary actions and pupils could lose access to their iPad for few days/weeks.

Furthermore, school management might arrange a meeting with pupils’ parents/guardians to discuss this issue and how to avoid it in future.

**Nancy** *“students sign an agreement when they received the iPad that they are going to use it properly, and they are not going to navigate other sites or applications other than those already available as this will be a violation of the agreement which their parents have already signed.”*

### **Summary of Theme Three**

Findings of this theme revealed that institutional factors such as technical support and ICT policy formed the basis for better school environment that encourages ICT integration. Findings showed that ICT integration is receiving lots of attention from key stakeholders in developed and developing nations. It is also evident in literature that the institutional factors enabled teachers to understand why they need to use ICT and how to operate and use them in their teaching practices efficiently (See for example: Albugami & Ahmed, 2015; Badran et al., 2021; Bozkurt, 2016; Drossel et al., 2017; Ekberg & Gao, 2018; Fernández-Gutiérrez et al., 2020; Gil-Flores et al., 2017). These studies confirm that the overall goal of ICT integration is to help teachers recognise the efficient role of integrating ICT in their teaching practices. The also confirm that this recognition should help teachers adopt more constructive teaching approaches that can enhance pupils' learning performance. However, findings revealed a number of factors that have formed obstacles to participants while using ICT in education.

ICT policy was the first institutional factor. Findings revealed that this factor was essential for the smooth and successful integration of ICT in secondary education. Findings showed that the implementation of ICT policy have, positively or negatively, affected teachers' intentions to integrate ICT in their teaching practices. Findings also showed that in order to benefit from the potential improvements of ICT, key stakeholders should implement educational policies that support the efficient integration of ICT which, in return, can support better teaching and learning experiences. Participants said that ICT integration can form a challenge to them as secondary teachers if their role in this process is not clear or the expected outcomes do not align with their expectations. Thus, it is important that policymakers should take into consideration the constraints that teachers may in ICT

integration. They should not limit teachers' role in implementing ICT policy as merely users, rather they should recognise them as key actors in the entire process of integration.

Support was the second institutional factors revealed from findings of this theme. Support here referred to technical support that schools provide to teachers while they employ ICT in their teaching practices. Findings showed that the existence of adequate infrastructure and proper technical support have enabled participants to the potentials of educational technologies in developing education. The availability of a proper infrastructure (i.e., internet connection and technical support) have encouraged participants to employ the ICT innovations to develop their pedagogical practices for better learning outcomes. Participants perceived inadequate access to ICT resources, overcrowded classrooms, and the lack of technical and pedagogical support as impeding factors that have a significant effect on the process of ICT integration. They contended that technical support has affected their utilisation ICT into teaching. They perceived qualified and well-trained ICT technicians with the necessary technical skills an essential factor that supports the efficient integration of ICT. Teachers recognise the importance of technical support and its effect on their intentions to integrate ICT into their teaching practices. Teachers are not expected to perform their teaching duties and /or overcome the barriers of ICT integration without access to technical support. The damage or malfunction of ICT tools can interrupt teaching and learning and may lead to frustration among teachers. They may even become reluctance to employ ICT in their teaching instructions. Poor or unstable internet connection consumes time that teachers need to present the subject matter content. Other technical problems such as software and /or hardware malfunctions can obstruct the delivery of the lesson content or the classrooms activity. Thus, schools must facilitate technical support for teachers to help them maximise their adoption of ICT in the teaching-learning process.

In the next chapter, I will discuss the findings of the study and a conclusion of the study. I will also present the study recommendations and limitations.

## Chapter Five: Discussion and Conclusion

### 5.0 Introduction

This chapter discusses the findings presented in the earlier chapter and provides answers to the research's overarching question and subordinate questions as well.

**What are the experiences of secondary school teachers who integrate ICT into their classroom pedagogical practices in Egypt and Scotland?**

*Subordinate questions:*

- 1- *What are the perceived advantages of ICT integration within secondary education in Egypt and Scotland?*
- 2- *What are the perceived difficulties of ICT integration within secondary education in Egypt and Scotland?*
- 3- *What are the similarities and differences between Egypt and Scotland regarding ICT integration at secondary education?*

The study at hand aimed to explore the contextual factors that affected participants' experiences in integrating ICT in their teaching practices. Findings of the present study defined the role of ICT policy, teachers' preparedness, school infrastructure, and teachers' professional development as factors that can either support or hinder ICT integration at secondary schools in Egypt and Scotland. In the coming sections, I will discuss each factor in detail.

### 5.1 ICT Policy

The implementation of ICT policy can positively and /or negatively affect the pedagogical practices and the learning results (Ismail et al., 2020; Salam et al., 2018; Karunaratne et al., 2018). Through ICT policy, stakeholders can provide schools with

adequate infrastructure, ICT, and professional development courses for teachers (Oluyinka & Endozo, 2019). These resources can support the education reform plans and the successful integration of ICT in teaching and learning (Eltahir, 2019). The excessive emphasis on providing schools with ICT tools while ignoring the existing barriers could curtail the potential effect of ICT on the development of education (Kashada et al., 2018).

Vanderlinde et al. (2012) defined ICT policy as “.... a document that describes technical and infrastructure specifications but particularly describes the learning objectives for ICT use as well as strategies of its implementation” (p.507). Various studies supported this definition and confirmed that the presence of a national ICT policy enabled stakeholders to share their vision about the best practices of ICT integration and education reform plans. These studies also contended that ICT policy enabled stakeholders to define how these practices and reform plans enhanced the quality of education and developed the integration of ICT into teaching and learning. (see for example, Vanderlinde et al., 2012; Kozma & Vota, 2014; Beck, 2019; Ball, 2021; Aziz, 2020; Hanafizadeh et al., 2019). This definition also supports the findings of the present study about the significant role of ICT policy in overlaying the path for key actors in education to implement the necessary change for the nation’s reform plans.

Findings showed that ICT policy in Egypt and Scotland formed an integral element in the formation of participants’ experiences in ICT integration. In Egypt, the Ministry of Education and Technical Education in Egypt (MoETE) formed Technology Development Centre (TDC) as a preliminary attempt to introduce ICT in education. TDC operated as a centralised umbrella that oversees all the MoETE plans to digitise the pre-university education (i.e., Primary, intermediate, and secondary) (MCIT, 2006). In 1999, the Ministry of Communication and Information Technology (MCIT) was formed as the first governmental

organisation responsible for planning and implementing the country's ICT reform plans. MCIT introduced the first national ICT policy in 1999. This policy considered ICT as a top priority for the country's educational development and economic prosperity. The policy stressed the need to invest in workforce and infrastructure to expand the ICT industry and support the development of the society, in general, and education, in particular. The document stated that pupils and teachers should have access to technology innovations such as desktop computers, overhead projectors, and TV educational channels. Thus, the document focused on equipping schools with computer laboratories and multimedia suites to help teachers integrating ICT into their pedagogical practices. The document also pointed out that teachers should receive relevant ICT training courses to enhance their professional development continuously (Abdrabo, 2018; Badran, 2021). The document declared that ICT professional training programmes should lead to sustainable development of teachers' technical and technological skills that would enable them employing technology innovations in their teaching practices.

To align with the goals of this policy, MoETE in Egypt has launched several technology projects. The MoETE in cooperation with the MCIT launched several projects such as *Smart School net project (SSNP)* the ICT clubs, *the Think.com project*, and *the international computer driving license (ICDL)*. Recently, the MoETE and the MCIT launched the Edu 2.0 project to replace the current educational system with more modern digitised educational system (MCIT, 2018). Edu 2.0 stresses on digitising pre-university education by infusing technology into the curriculum and providing teachers and pupils access to virtual learning environments (VLEs) that enable teachers to blend in-class and virtual teaching and learning practices (MCIT, 2019). To support the Edu 2.0 project, the MoETE and the MCIT initiated some digital learning projects such as *E-Learning Competence Centre (ELCC)*, *the Digital Libraries (DL)*, *the Egyptian Knowledge Bank*

(EKB), *Edmodo* online platform in addition to the educational *tablet*. The MoETE aimed that these projects should interpret the goals of ICT policy into tangible results and develop the pre-university and tertiary educational systems and to prepare pupils to become competitive in the labour market. These projects also aimed to bridge the digital gap between urban and rural areas despite obstacles such as socioeconomic disparities and infrastructure constraints.

Nonetheless, these projects turned into excessive emphasis on the providing secondary schools with loads of technology tools although these schools still suffer from drastic conditions (Shahin, 2021). Though the MoETE provided classrooms at secondary schools with interactive boards and distributed educational tablets to pupils and teachers however, there are two fundamental issues that are not yet addressed: the overcrowded classrooms and the infusion of ICT into the curriculum of secondary education. Findings showed that these issues hindered participants from integrating ICT into their pedagogical practices. They also restrained their efforts to employ these technology innovations and provide pupils with interactive learning activities. Furthermore, the high ratio of pupils to teachers at secondary education forced teachers to utilise the interactive board as a mere substitute of the traditional black/white board.

Teachers' professional development was another aspect that the ICT policy has addressed. The policy considered teachers' professional development an essential element for the success and/or failure of ICT integration at secondary education . The policy pointed out that these courses should provide teachers with the proper knowledge to help them integrating ICT into their pedagogical practices effectively. However, findings showed that training courses were either short, more theoretical, held far away from teachers' residence, or held on times that contradicted with their family commitments (Mustafa & Al-Hamadi, 2017).



Findings from Scotland, on the other hand, confirmed that Scotland's ICT policy perceived ICT utilisation as a priority to reform education and to enable teacher and pupils to improve their confidence in utilising ICT in teaching and learning (Hardley et al., 2021). Findings revealed that the Scottish education policy has defined the country's goals about ICT integration in education and was inspired by two initiatives: A Teaching for the 21<sup>st</sup> century and the Curriculum for Excellence (CfE). These two initiatives categorise future teachers into four models: effective, reflective, enquiring, and transformative (Scottish Gov, 2008). Effective teachers are those who are able to gain pedagogical, technical, and technological skills that enable them to use technology innovations in their teaching practices. Reflective teachers are able to reflect on these skills during teaching. Enquiring teachers are able to implement research results into their teaching practices, and the fourth type is the transformative model which recognises teaching as a method of change for better future (OECD,2021). These four models of teachers were the core pillars of the Scottish education policy that strengthened the government's efforts in developing teachers' technological and pedagogical skills and enable them to employ pupil-centred approaches that infuse ICT technology in education instead of traditional approaches (Education Scotland, 2016).

To implement ICT policy, the Scottish government adopted several ICT projects to improve ICT infrastructure at secondary schools and enhance teachers' professional development. Projects such as *Glow*, which was the first national online learning platform, and the Scottish Wide Area Network (SWAN) provided teachers and pupils with educational resources (Gabriel et al., 2022). The government has also provided many schools with ICT tools such as smart boards, laptops/Chromebooks, and iPads. These tools to help teachers integrate these technologies into their pedagogical practices to provide pupils with meaningful learning experiences. Therefore, it is noticed that schools in Scotland enjoyed a

reliable ICT infrastructure and did not suffer from overcrowded classrooms. Stakeholders have also placed significant emphasis on the integration of ICT into the different areas that are covered by the Curriculum for excellence (CfE) (Hardley et al., 2021). Thus, participants were able to adopt pupil-centred learning approaches that require the employment of ICT in the various learning activities to encourage active learning. Thus, participants said that the integration of ICT and the employment of these pupil-centred approaches have improved pupils' creativity and enhanced their cognitive skills in problem-solving, self-regulation, and higher-order thinking. Findings also showed that ICT policy highlights the role of professional development courses in promoting teachers' knowledge of pedagogy, content, and technology. Findings revealed that the General Teaching Council for Scotland (GTCS) encourage teachers to develop their ability in utilising ICT in their teaching practices to "know how to embed digital technologies competently to enhance teaching and learning" (GTCS, 2021, p.7). GTCS considered this ability as one of the mandatory requirements for teachers who pursuit full registration to become qualified teachers. GTCS also considered ICT as an effective tool that allow teachers to excel in their teaching and "have secure knowledge and understanding of the current guidance on the use of digital technologies in schools" (ibid).

Findings also showed that the implementation of this policy has a significant effect on the development of pupils' knowledge and cognitive skills that should enable them to meet the challenges of contemporary society (Humes & Priestley, 2021). The policy also considered the important role of pupils in the success of ICT integration and pointed out that pupils should be able to show their ability to "use technology for learning" in order to be considered a "successful learner" (Scottish Govt, 2009. p.iii). Furthermore, the policy promoted the use of technologies in delivering the subject matter content attractively. This, in

return, should increase pupils' level of interaction and develop their critical thinking skills (Bullock & Lavis, 2019).

## **5.2 ITE and Teachers preparedness**

Preparing pre-service teachers to join the teaching profession depends on the quality of ITE programmes. The structure of these programmes and the core knowledge they provide to pre-service teachers should enable them to understand the significant role of ICT integration in enhancing their pedagogical knowledge of the subject content. Findings of the present research revealed the components of ITE programmes in Egypt and Scotland and defined how these components have positively and/or negatively affected participants' experiences in the integration of ICT in education.

### **5.2.1 Structure of ITE programmes**

According to Tondeur et al. (2017) ITE plays a significant role in developing pre-service teachers' ICT skills. They said that initial teacher education has positively affected novice teachers' readiness to integrate ICT in their teaching practices. They found that there was a relationship between novice teachers' integration of ICT in their teaching practices and their experiences of using technology at ITE institutes. Therefore, the goal of ITE programmes is to scaffold pre-service teachers with the required knowledge to improve their teaching skills (Flores, 2020). Proponents of ICT integration argue that ITE programmes are essential for preparing aspiring teachers for their future profession. They also contend that ITE programmes enable pre-service teachers to recognise the significant role of ICT integration in developing their pedagogical practices (see for example, Adams, 2022; Andreassen et al., 2022; Craig, 2016; De Rossi & Trevisan, 2018; Fernández-Batanero et al., 2022; Gale & Parker, 2017; Grudnoff et al., 2016; Hall et al., 2018). Findings of these studies align with the findings of the present study. These findings suggest that the integration of ICT

into ITE programmes provide pre-service with the opportunity to enhance their technology skills and increase the level of their self- confidence in operating and utilising ICT. Findings also showed that the integration of ICT in ITE curricula enable pre-service teachers to engage in ICT-based activities, become digitally competent, and reflect their ICT competency in their future teaching practices. Findings revealed that ITE programmes in Egypt and Scotland have their unique characteristics. The main routes of ITE for secondary education that were provided in both countries were similar to an extent. Both countries provided two main routes: combined degree (BEd) with a Teacher Qualification (TQ) and the concurrent degree followed by a one-year PGDE with TQ awarded separately (Beck & Kennedy, 2018; El-Bilawi & Nasser, 2017). The structure of these routes has two elements: theoretical knowledge and school placements. In the first element, pre-service teachers study different modules about the subject matter content, pedagogy practices, educational policies, and education technology (El-Halawany, 2018; Adams & Burns, 2023). School placements is the second element that provides pre-service teachers with the opportunity to, practically, implement the theoretical knowledge in the classroom (MoETE, 2014). School placements also enable pre-service teachers to recognise the practical use of ICT in teaching and learning and how it can develop their pedagogical practices to deliver meaningful learning (Ginsburg & Megahed, 2021). Findings showed that the differences between ITE programmes in Egypt and Scotland were about the structure of these programmes, the core knowledge pre-service accumulate, and ICT infrastructure.

In Egypt, the two routes of ITE (i.e., combined, and concurrent degrees) often experience improper ICT infrastructure, and overpopulated venues (Times Higher Education, 2023). The current ITE programmes are characterised by their traditional approach of pedagogy and their inability to keep pace with contemporary developments in education (Megahed & Osman, 2020). Teacher-led approaches and rote learning dominate the practices

in these programmes. Interactive learning approaches such as workshops, group work, and online environments are not integrated into the structure of the current programmes. The goals and standards of these programmes are also unclear. They do not specify the required skills and competencies for pre-service teachers to acquire once they have finished their initial education (UNESCO, 2023). Though pre-service teachers study in-depth courses of the subject of their specialism, these courses are not linked directly to the curriculum of secondary education.

In terms of infrastructure, findings revealed that ITE routes have limited ICT facilities. Libraries are not equipped with enough technological tools to support the needs of the large number of students to access electronic resources that support their learning. This issue, in return, affect their knowledge about the role of ICT in the development of their pedagogical practices. Access to computer suites is granted to students at computer sciences department only while student at other department cannot use these suites to practice the use of ICT for their future teaching practices (Shahin, 2021). Furthermore, ICT is not integrated into the curriculum of ITE (Khalil, 2019). Pre-service teachers study an ICT module that provide them with theoretical information about the development of educational technology and do not have the opportunity to implement this knowledge practically (Ismail, 2016). Findings showed that this issue affected pre-service teachers' knowledge of the secondary school curriculum when they joined the teaching profession (El-Halawany, 2018).

Graduates of subject-specific faculties (concurrent route) do not study any courses about pedagogy or attend school placements. They rather practice teaching mini-teaching sessions when they study the on-year PGDE. Mini- teaching sessions form a part of the structure in both the PGDE and the combined route (Megahed & Osman, 2020). These sessions are conducted during the second year of the programme at faculties of education and at the PGDE programme as well. These sessions are conducted on weekly basis and last for

four hours: a two- hour lecture followed by a two-hour mini-teaching session (Khalil, 2019). In these mini-sessions, pre-service teachers are divided into groups of fifty to seventy students and are asked to plan a lesson and present it to their peers (El-Sayad et al., 2021). These sessions are designed to encourage pre-service teachers to examine the teaching approaches to know how to employ them in real classroom. However, participants said that these mini sessions offered them limited opportunities to examine their teaching capabilities and how to employ ICT in classroom. Participants defined the overpopulated venues, the insufficient ICT tools, and high ratio of students to faculty as barriers that did not allow them to practice teaching in these sessions.

Findings confirmed that school placements played a significant role in forming participants' experiences about the art of teaching, classroom management and ICT integration. These findings align with the findings of earlier studies (see for example: Mohamed et al., 2017; Hall et al., 2018; Megahed & Osman, 2020; Craig, 2016; Bozkurt, 2016; Rowston et al., 2022; Jita, 2018; Egan et al. 2018). These studies highlighted the significant role of school placements and how they formed an opportunity for pre-service teachers to practice teaching and improve their ICT skills.

In Egypt, findings revealed that the academic year at both faculties of education and the subject-specific faculties is thirty-four weeks. Each year is divided into two semesters, and each semester is seventeen weeks long. Fifteen weeks are allocated for the on-campus learning activities while two weeks are for final exams. Pre-service teachers start school placements on the third and fourth years of the ITE programmes (Moustafa et al., 2022). They attend a sixty- weeks block of school placements over four semesters. They first attended a thirty- week block at a preparatory school on the third year while the other thirty-week block at an intermediate or secondary school on the fourth year. They attend one day every week at schools for fourteen weeks. During that day, they spend only four hours of the

classroom's contact time observing expert teachers. They also attend on-campus learning activities on the remaining days of the week (Khalil, 2019). They may start to teach part of the class period after six weeks then they are allowed to teach a full class period for the rest of the placement block (Megahed & Osman, 2020). The last week of the semester of the 3<sup>rd</sup> and 4<sup>th</sup> year is the longest week of school placements. Pre-service teachers attend a full week at schools and spend six hours of classroom's contact time on each day of that week (Ismail, 2016). Participants said that these school placements would have been a supportive factor for them to benefit from the experiences of expert teachers and to implement the theoretical knowledge in real classroom if they were long enough. They believed that these short school placements have negatively affected their experiences about the effective implementation of ICT in their pedagogical practices.

In Scotland findings were markedly different. ITE programmes in Scotland are designed to enable pre-service teachers to accumulate knowledge about pedagogical practices, technology skills, and the subject content. These programmes provide pre-service teachers with an in-depth knowledge about the innovative teaching approaches. They teach pre-service teachers how to employ these approaches in effective teaching activities that motivate pupils and increase their level of attainment. During these programmes, pre-service teachers become aware of the significance of ICT integration in their teaching practices and how it will, positively, affect pupils' learning outcomes. These programmes also enable them to select the proper teaching strategies that allow the integration of ICT into secondary education curriculum (i.e., CfE). Furthermore, they learn how to plan lessons, select relevant supplementary materials that explain the different areas of the curriculum, and device learning activities that increase pupils' level of interaction (Adams & Burns, 2023).

Participants said that these ITE programmes encouraged them to employ ICT in their pedagogical practices. They confirmed that ITE programmes in Scotland were structured to

enable them to understand the role of pedagogical theories and educational technologies in the development of teaching and learning practices (Adams, 2022). They said that these programmes enabled them to discuss the current issues in education and explore the practical solutions for these issues and to examine the nature and purpose of education in Scotland, and other local and international settings (Beck & Kennedy, 2018; Kennedy et al., 2021). In contrast with Egypt, Higher Education Institutes (HEIs) in Scotland did not suffer from overpopulated venues. Currently the average ratio of faculty to students in Scotland is 14 students to a single lecturer: 14-1 (Times Higher Education, 2023). Participants said that this low ratio gave them the opportunity to discuss with the lecturers their thoughts and concerns about their learning (Attard Tonna & Shanks, 2017). It also provided them with balanced opportunities to conduct mini teaching sessions to practice their teaching skills before joining school placements. Findings also revealed that HEIs in Scotland have an advanced infrastructure that supports pre-service teachers' learning needs (Riddell, 2016). HEIs provide pre-service teachers with free internet access, access to communal computer areas, in addition to physical and virtual access to libraries (Altan & Alakan, 2023). Courses of ITE programmes are delivered through a variety of blended teaching methods such as lectures, workshops, and online virtual learning. Findings also showed that HEIs encouraged pre-service teachers to conduct various self-study activities. These activities included reading articles, books, and to undertake research about contemporary teaching and learning approaches as well as engaging into collaborative learning activities with their peers (Adams et al., 2021). Participants said that these strategies were implemented by the HEIs to encourage them to form work groups and use ICT tools such as interactive boards and laptops for in-class and online learning activities. Participants recognised the effect of these activities in developing their teaching skills and enhancing their critical thinking skills as well. They



also said that these activities enabled them to understand their role in the development of pupils' learning outcomes (Priestley et al., 2015).

Findings revealed that the subject matter modules in these ITE programmes focus on the Curriculum for Excellence (CfE) which is Scotland's national curriculum for pre-university education. Findings showed that the goals of the CfE are concerned with developing pupils' literacy, numeracy, arts, science, mathematics, social studies, and technology to become successful learners. Participants said that the subject matter modules they have studied covered the different areas of the CfE. They contended that ICT was embedded in these different areas. They also said that focus of the ITE programmes was to train them about the integration of ICT in classroom to deliver the different areas of CfE to pupils efficiently. Therefore, participants experiences about ICT integration into their pedagogical practices was positive and enabled them to teach the different areas covered in this curriculum efficiently (Hart-Anderson & Holme, 2023).

Findings also revealed that school placements provided participants the opportunity to practice teaching in real classroom and to recognise how pupils learn (Attard Tonna & Shanks, 2017). Findings showed that ITE programmes provided pre-service teachers with long school placements to make sure that they were able to implement the theoretical knowledge in the classroom (Hall et al., 2018). Participants contended that these placements formed their primary experiences about teaching in a real setting and how the utilisation of ICT supported their efforts in integrating ICT into their teaching practices. Combined undergraduate degrees at faculties of education (i.e., BEd /MEd) allocate eighteen to thirty weeks for school placements during the length of the study. The PGDE for secondary education is equally divided between the on-campus activities and school placements. An eighteen-weeks block is allocated for the school placements and an eighteen- weeks block for the on-campus study activities. These school placements provide pre-service teachers full-

time access to schools every day of the week. Pre-service teachers spend an average of twenty-three hours of the classroom contact time every week during these placements. These long placements enable participants to observe experienced teachers while they are teaching and how they employ ICT in their teaching practices (OECD,2015).

To summarise, findings revealed ITE programmes formed the primary source for pre-service teachers' knowledge of pedagogical practices they need to employ in the classroom to deliver the subject matter content. The quality of ITE programmes was one of the crucial factors that affected pre-service teachers' use and integration of ICT in their future instructional practices (Gale & Parker, 2017). Therefore, ITE programmes should enable pre-service teachers to accumulate knowledge about effective teaching and learning practices and improve their technology skills as well (Flores, 2020; Rowan et al., 2021).

While the ITE programmes in Egypt did not enable participants to form positive experiences about the significant role in of ICT in developing their pedagogical practices, these programmes in Scotland provided better opportunities to participants to recognise the significant role of ICT integration in developing their teaching practices efficiently. These differences appeared from the excessive emphasis on rote learning, the poor conditions of the infrastructure at ITE routes, the outdated curricula that disregards the integration of ICT, and the absence of secondary schools' curriculum in the structure of these programmes. On the other hand, participants from Scotland have different experiences about ITE programmes. They concluded that they have formed positive experiences about the importance of integrating ICT in education as they were able to use ICT tools during their initial education (Mifsud, 2018). The integration of ICT in the curricula of ITE and secondary education has also enabled them to recognise the importance of these tools in providing pupils with better learning experiences. Furthermore, the long school placements familiarised them with the

classroom environment as they observed how expert teachers teach utilised ICT to enhance pupils' academic performance.

### **5.2.2 TPACK Elements in ITE programmes**

The aim of ITE programmes, as discussed in the earlier section, is to prepare pre-service teachers to become effective teachers in their field of specialism. The design of these programmes should help pre-service teachers building adequate knowledge about the subject matter content, the pedagogical approaches, and educational technology as well (Flores, 2020). The accumulation of the in-depth knowledge of the subject matter should help pre-service teachers supporting pupils' learning needs and understanding the different areas of the curriculum (De Rossi & Trevisan, 2018). These courses should also enable pre-service teachers to recognise the role of pedagogy in forming their knowledge about the design of curriculum, lesson planning, teaching approaches, psychology of learning, and technology integration (Uslu, 2018). Finally, these courses define the significant role of ICT integration in the pedagogical practices and how it enables them to deliver meaningful learning experiences. Upon the completion of these courses, pre-service teachers should combine in-depth knowledge of the subject matter content with the pedagogical approaches that employ ICT to deliver the curriculum. This, in return, should enrich pupils' knowledge of the curriculum and enable them to achieve better learning outcomes (Adams & Burns, 2023).

The aforementioned types of knowledge form the triad of the TPACK framework. According to Mishra and Koehler (2006) the components of the TPACK equip pre-service teachers with the essential knowledge they need in their future teaching profession. In other words, the TPACK framework does not inform the procedures that guide pre-service teachers and/or in-service teachers to integrate ICT in classrooms. Rather, it structures the type of knowledge that pre-service teachers and/or in-service teachers should accumulate of pedagogy, content, and technology. These types of knowledge can support them integration

ICT, successfully, in their pedagogical practices. Findings showed that the components of the TPACK framework existed in the structure of the ITE programmes in Egypt and Scotland. However, the differences between these programmes were in the core knowledge of these programmes.

The current structure of the ITE programmes in Egypt do not allow for the interaction of the TPACK elements: pedagogy knowledge (PK), content knowledge (CK), and technology knowledge (TK). The curricula of these programmes are outdated and focus on rote learning and memorisation. It is noticed that there is an extensive emphasis on pedagogy and content knowledge more than technology knowledge. In both routes of initial teacher education, pre-service teachers study courses about the subject matter content in addition to a number of courses about teaching and learning theories, pupils' psychology, and class management. Those who specialise in teaching English language, for example, study English literature, grammar, translation, essay writing, and drama. However, they do not study about the curricula of pre-university education (i.e., preparatory, intermediate, and secondary) (Megahed & Osman, 2020). The fragile infrastructure and the large number of pupils in these faculties form a barrier for pre-service teachers to practice employing ICT in their pedagogical practices (Moustafa et al., 2022). Furthermore, ICT is not integrated into the ITE curriculum, rather it is a separate module that focus on theoretical knowledge about the role of technology in developing education. School placements are short and do not enable pre-service teachers to observe how expert teachers employ ICT in their teaching practices (Ahmed & Sayed, 2021). They attend an average of four hours per week during the school placements. These short placements do not allow them to implement their knowledge of teaching and learning or to practice using ICT in classroom activities.

Therefore, I can argue that the TPACK components are partially integrated in the structure of these ITE programmes. Though the excessive focus on the accumulation of the

subject matter content (i.e., CK) enable pre-service teachers to form a considerable knowledge of the content but their knowledge of the curriculum itself is imperfect. Also, ICT is not integrated in the curriculum of the ITE programmes and, therefore, they do not have the opportunity to improve their knowledge about technology (i.e., TK) and how to employ it in their future teaching practices. Thus, the absence of the TK element did not help participants to enhance their knowledge about the role of technology in developing their pedagogical and content knowledge. Furthermore, this absence affected their technological pedagogical knowledge (TPK) and technological content knowledge as well.

By way of contrast, findings confirmed that participants from Scotland were able to form better experiences about their initial education programmes. In Scotland ICT study form an integral part of the ITE programmes. Pre-university curriculum (i.e., Curriculum for Excellence) is embedded into the curriculum of ITE programmes (Humes & Priestley, 2021). These programmes are designed to enhance pre-service teachers' technology skills and enable them to employ ICT in the different subject areas that are covered in the CfE such as literacy, numeracy, health and wellbeing, equity, and technology literacy as well (Livingston & Hutchinson, 2019). ITE programmes in Scotland also provide pre-service teachers the opportunity to attend long school placements to help them implement the theoretical knowledge they have studied (Attard Tonna & Shanks, 2017). The average class contact time in Scotland is twenty-three hours per week and pre-service teachers should spend twenty-three hours per week at schools over eighteen weeks (Priestley et al., 2018). These long school placements enable them to observe how expert teachers teach, how they manage classroom and provide support to pupils with learning needs, and how they employ ICT technologies in delivering their teaching practices (OECD, 2021).

Thus, participants said that during their initial education they were able to form a solid basis about the subject matter content. They were also able to employ constructive

teaching approaches that employ ICT. These approaches enabled them to empower pupils' learning and increase their level of attainment. Participants confirmed that these programmes provided them with balanced modules about the subject matter content, pedagogical studies, ICT utilisation in education, in addition to school placements (Gale & Parker, 2017). Findings showed that ITE programmes enabled participants to explore the different areas of the CfE, the goals of each area, how these areas support pupils' level of engagement, and develop their critical thinking skills (Adams, 2022). Participants said that they studied several on-campus and online training course about the use of ICT technologies in teaching and learning. Furthermore, participants had to, provisionally, register with General Teaching council for Scotland (GTCS) once they finished their tertiary study and before they joined school for the one-year probation period (GTCS, 2012). During this period, they had to take a number of training courses to promote their knowledge in various fields such as school administration, classrooms management, health and wellness of pupils, and the utilisation of recent innovations of educational technologies (Beck & Kennedy, 2018). The completion of these courses and the probation period qualified them to meet the standards for full registration with GTCS. Thus, it can be said that the TPACK components are better integrated into the structure of ITE programmes in Scotland (Altun, 2019; Lachner et al., 2021; Celik, 2023; Schmid et al., 2021).

### **5.3 School infrastructure**

Several studies explored the significance of school infrastructure and how it affected the development of teaching and learning (See for example: Barrett et al., 2019; Siswanto & Hidayati, 2020; Ruhyana & Aeni, 2019; Gil-Flores et al., 2017; Herwan et al., 2018; Hariyanto et al., 2021). These studies discussed the effects of classroom size and technical support on teachers' performance and pupils' health and wellbeing, behaviour, engagement, and learning achievements as well. Findings of the present study align with the findings of

these studies. Findings showed that quality of school infrastructure provided participants and pupils with healthy and safe environment. They perceived the improvement of schools' infrastructure should be a top priority to stakeholders. While part of the participants said that their ability to employ ICT in their pedagogical practices was affected by the conditions of the school infrastructure, others contended that school infrastructure enabled them to provide pupils with creative teaching practices that enhanced their learning outcomes.

### **5.3.1 Classrooms Size**

Findings of this study confirmed that classroom size formed an issue of concern in Egypt and Scotland. While the classroom size was a critical issue in Egypt, this was not always the case in Scotland. In Egypt, most secondary schools suffer from overcrowded classrooms. It is normal for a single teacher to teach fifty to seventy pupils in one classroom while in Scotland a single teacher teaches an average of twenty to thirty-three pupils (Sobhy, 2019; Audit Scotland, 2021). This gap between both countries raises several challenges in each context as overcrowded classrooms reduce teachers' ability to use ICT in learning activities effectively.

In Egypt, findings revealed that Egypt suffer from a shortage of school buildings. Many schools run two shifts to accommodate the large number of pupils. It is normal to accommodate a minimum of fifty pupils in the same classroom (Farrag et al., 2021; Ismail & Kinchin, 2019). Participants confirmed that this situation imposed different challenges on their ability to teach or to conduct interactive learning activities. Due to the large number of pupils, the classic row style with tight spaces between the desks is the common classroom setting at secondary schools. The need to accommodate this large number of pupils in the classroom imposes this type of classroom setting (Amusa & Toriola, 2013). Participants said that the current situation in classrooms imposed this type of setting which enforced them to accustom their teaching preferences to suit this challenge. Consequently, this issue restricts

secondary school teachers' ability to move around the classroom and observe pupils who may partially and/or totally struggle to comprehend the subject matter content. Participants confirmed that they were not able to provide those pupils with individual care to raise their academic level similar to their peers (Zaki Ewiss, 2021). Findings showed that there are interactive boards in every classroom and each pupil has received an educational *tablet*, but teachers and pupils do not have access to desktop computers or laptops in the classroom. Findings also showed that participants employ teacher-centred approaches in favour of pupil-centred approaches as there is not enough space in these crowded classrooms to use interactive boards to conduct ICT-based learning activities (Ibrahim & Ibrahim, 2017). Classroom management is another challenge at secondary education. Teachers are obliged to implement strict classroom management measurements to avoid pupils' disturbance (Desouky & Allam, 2017).

Findings revealed that the introduction of the *tablet* has negatively affected participants' experience of integrating portable technology in education. They were enthusiastic that this project could help them utilise a mobile technology in their teaching activities and employ constructive learning approaches to improve pupils' academic performance. They regarded the *tablet* as streamlined feedback channel they could employ to address pupils' academic problems and to provide them with practical solutions. They also thought that this type of technology could increase pupils' level of engagement and improve their learning skills. However, findings revealed that the MoETE imposed restrictions on teachers and pupils' use of the *tablet* in the classroom. Also, teachers and pupils encountered technical issues that did not enable them to integrate it into their teaching practices as planned. The MoETE, at first, limited the access on the tablet to specific educational websites such as the Egyptian Knowledge Bank (EKB) and the final exams platform. Apps that teachers can use on the *tablet* to monitor the classroom activities or to connect it to the



interactive board are not active (Abdullah, 2022). Furthermore, the technical issues of the tablet's security system negatively affect the effectiveness of the *tablet* project. The security system of the *tablet* is not strong enough and can be penetrated as it suffer from technical flaws. Users can override the firewalls and gain access to social media, and entertainment websites. Though the MoETE managed to resolve this issue in a later stage, there are still many access restrictions in place. Furthermore, pupils at secondary education right now use the *tablet* as electronic platform to perform exams.

In Scotland, participants did not experience the overcrowded classrooms issue. Findings revealed that the Scottish government implements strict health and safety standards at secondary schools. Participants said crowded classrooms could limit their abilities to conduct ICT- based learning activities. They said that crowded classrooms would result into classroom management issues such as undesired disturbances or loss of class time. They also thought that crowded classrooms could limit pupils' access to ICT particularly at schools that have limited number of laptops and/or Chromebooks or schools that did not provide pupils with iPads/tablets yet.

Findings showed that secondary schools have ICT technologies such as smart boards, laptops/Chromebooks, and iPads in most classrooms. Classrooms accommodate an average of twenty pupils to a maximum of twenty- five pupils. Therefore, secondary school teachers are able to employ ICT in learning activities and deliver meaningful learning experiences to pupils. They are able to use smartboards for ICT-based activities to engage pupils, increase their level of interaction, and improve their cognitive skills. They also use portable technology such as iPads and laptops/Chromebooks to personalise pupils' learning experiences, support their individual learning needs, and improve their creativity. Furthermore, the availability of different ICT technologies and the small number of pupils at classrooms enable secondary school teachers to adopt contemporary teaching approaches that

depended on pupils-led learning strategies. These strategies are more effective than the traditional spoon-feeding learning approaches (Majid Gilani & Faccia, 2021). Findings showed that employing ICT into these teaching strategies resulted in the development of pupils' academic performance (Craig, 2016). These teaching strategies enable secondary school teachers providing equal support to all pupils, in general and to those pupils with low level of performance and those who struggled to pace with their peers in particular (Gabriel et al., 2022). ICT tools at secondary schools have active Apps and applications that teachers can use to manage classroom activities and monitor pupils as well. These ICT tools also have strong security system and firewalls that restrict access to social media websites that could divert pupils' attention in the classroom (Turner-Cmucha & Aitken, 2016). Teachers have access to monitoring application on desktops and iPads to monitor pupils during class time. Through this application, teachers make sure that pupils are focusing on the lesson presentation and doing the relevant learning activities.

### **5.3.2 Technical support**

According to BECTA (2004), there are two types of technical issues: "lack of technical support" and "fear of things going wrong" (pp. 15-16). Findings of this study showed that teachers who receive consistent technical support are able to integrate and employ ICT in their teaching practices efficiently. These findings are consistent with Murungi and Gitonga's (2015) extensive literature review about technical support for teachers. Murungi and Gitonga (2015) argued that technical support provided to teachers while using ICT was one of the most key factors that affected their intentions to integrate ICT in their pedagogical practices. The findings are also consistent with the findings of the British Educational Communication and Technology Agency (BECTA) (2004)'s literature review about ICT integration in teaching. The review revealed that the lack of technical

support to teachers and maintenance of ICT tools increased the possibility that these tools will malfunction while employed by teachers in teaching and learning.

Findings from Egypt showed that in with the introduction of Manahil Al Maarifah project, the MoETE assigned administrative employees as support technicians. They were assigned to look after the software and hardware malfunctions of the ICT tools, fix them if they can, or to report them to the central IT services department if they were difficult for them to handle. However, most of them lack the technical background that could qualify them as certified technical support staff (Amer, 2020). They do not receive adequate training courses to enhance their knowledge about these modern technologies and manage the technical issues teachers may encounter while performing their teaching practices. Furthermore, the education authorities do not provide schools with scheduled maintenance services to ICT technologies at schools. Findings showed that this issue affects the quality of ICT performance. Findings showed that there is an IT department at almost every secondary school who are graduates of computer sciences department. They are mainly responsible for teaching computing and managing the electronic communications of the school to the MoETE and the local educational administration. They also provide technical support to teachers and pupils if they encounter difficulties accessing the electronic exams platform on the *tablet*. However, they sometimes coordinate with the central IT services department to, voluntarily, handle the interactive boards' hardware and software (Adel Ali & Arshad, 2018). Thus, they are not always able to support teachers when technical issues happen.

This issue affect teachers' intention to, constantly, employ ICT in their teaching practices. These findings align with the findings of previous studies. Francom's (2020) study, for example, investigated teachers' perceptions of the barriers to technology integration in education. He found that the risk of technical failures of an ICT equipment or being out of service for a significant amount of time increased when regular maintenance was not

performed. Albugami and Ahmed (2015) considered the absence of technical support as one of the most significant barriers to ICT integration. Findings of their study revealed that participants were not able to use the interactive boards as the support team was not able to manage the software and/or hardware malfunctions. Liu et al. (2017) also studied the factors that affected teachers' experiences with ICT integration and identified access to technical support as one of the significant factors to the success of ICT integration. The study showed that technical support team has essential role in maintaining quality technical service as they handled various technical issues that occurred when teachers were using ICT in the classroom. Furthermore, Drussel et al. (2016) studied school characteristics to understand the predictors that could affect teachers' use of ICT. They found that lack of technical support was perceived as one of the hindering factors for teachers to integrate ICT in their teaching practices. Consequently, teachers who employ technology on a regular basis require dependable machine tools to support their teaching practices. This explains the concerns of participants from Egypt about the inadequate technical support available in their educational settings and how it affects their decision to use ICT into their teaching practices.

In Scotland, findings revealed that participants from Scotland were satisfied with the quality of technical service provided by the technical support team at schools. They confirmed that most technicians were specialised staff and had significant technical experience. Those technicians played a significant role in maintaining ICT tools and provided teachers with adequate technical support that kept the ICT tools work in an efficient manner. Education authorities in Scotland provide secondary schools with diverse levels of technical support. This includes the regular provision of technology equipment, software updates, and staff training as well. Councils either employ technical support teams, arrange corporate agreements, or appoint outsource providers to support and develop the central and local ICT systems (Brown et al., 2021). Findings also showed there is a qualified or experienced

computer system technician who manages regular maintenance issues. Findings also revealed that technical teams were self-taught in many aspects of their work. Education authorities offer technical support teams various professional development training to improve their ICT qualifications and enhance their job performance (Craig, 2016). Consequently, teachers are able to, effectively, employ ICT into teaching activities that improve pupils' academic performance. Furthermore, corporate ICT services at Councils provide technical support to secondary schools as well. These findings were similar to a number of studies. Lawrence and Tar's study (2018), for example, explored the factors that affect teachers' adoption of ICT. They found that technical support was one of the school-level barriers that affected the full and effective integration of ICT into teaching and learning process. Mirzajani et al. (2016) identified the factors that motivated teachers to integrate ICT in their teaching practices. The study findings revealed that providing teachers with proper ICT tools and professional technical support enabled teachers to adopt ICT in the classrooms and to use them in their teaching practices regularly.

However, technical support is not always up to the expectations for many teachers. This happens at large schools where considerable number of teachers and pupils use smartboards, computers, iPads /laptops, the age of these tools, and the level of technical service provided through the council's central ICT team. Findings revealed that the first two reasons negatively affect the performance of these tools. They result in numerous technical problems such as online connection issues, software updates, and disruption when using applications. The third reason is concerned with the technical services that some of Councils' corporate ICT services provide to schools. These departments may take longer times to solve software or hardware issues. These findings align with several studies about the positive effect of ICT integration in education (see for example, Wu et al., 2019; Turner-Cmuchal & Aitken, 2016; Badran et al., 2021; Haleem et al., 2022). These studies found that adequate

technical support helped secondary schools to keep better standard of their infrastructure and enabled teachers to recognise the potentials of ICT in developing their teaching practices.

#### **5.4 Professional Development (CPD/CLPL)**

Literature confirms that professional development aims to enhance teachers' pedagogical knowledge and improve their technology skills. Several studies explored the relationship between training courses that in-service teachers receive and their ability to integrate ICT into their teaching practices (see for example: Al Asmari, 2016; Roesken-Winter et al., 2015; Tannehill et al., 2021; Hemphill et al., 2015; Geldenhuys & Oosthuizen, 2015). These studies provided several interesting findings. Firstly, they confirm that professional development is an ongoing practice that supports the development of teacher's teaching capabilities and plays a significant role in the success of education. They argue that professional development programmes enable teachers to employ ICT into constructive teaching and learning approaches to deliver meaningful learning (Derakhshan et al., 2020). They perceive adequate ICT training courses as essential to develop teachers' ICT skills that can support them to integrate ICT in their teaching and learning practices. These findings align with the findings of the present study. Participants from Egypt and Scotland confirmed that professional development affected their perspectives of ICT integration in their pedagogical practices. The effect of professional development in both countries differed according to the type, length, relativity, and continuity of these courses.

In Egypt, findings revealed that one of the persistent issues of the pre-university education is low quality of training programmes provided to in-service teachers' (El-Bilawi & Nasser 2017). The quality of these training courses affect the experiences of secondary school in ICT integration in their teaching practices. Though secondary school teachers receive several training courses about the subject content, teaching approaches, and the utilisation of ICT in teaching, the majority of these courses are not effective and lack the

adequate knowledge that can support ICT integration in education. Findings of the OECD's (2020) report support these findings. The report discuss the relationship between teachers' professional training courses and the integration of ICT in education. The report confirm that the competent structure of these courses enable teachers to access unlimited resources that can enhance their teaching practices. The report also confirm that providing teachers with effective ICT training courses encourage them to, continuously, use digital resources in their teaching practices. Findings also show that the MoETE in Egypt introduced several ICT projects in cooperation with local and international organisations to enhance the digital capacity of the pre-university educational system (Abdrabo, 2018). *Improved Quality of Teacher and Education Leader Professional Development (IQTELPD)* is one of these projects that aim to provide teachers with updated professional development courses to develop their teaching practices (Shahin, 2021; Pouezevara et al., 2014). The project supports the provision of comprehensive online and face-to face professional development courses to develop teachers, head teachers, and school administrators' ICT skills. However, the content, length, timing, and location of these courses are critical issues that affect their significant role in ICT integration. Most of these courses do not provide secondary school teachers with relevant information about the efficient utilisation of ICT in the different areas of the curriculum. Many of these courses are short and trainers are not able to cover different topics that can help teachers understand the significance of integrating ICT in education. Furthermore, on many occasions timing of most courses contradict with teachers' work schedules or personal & family commitments (Hargreaves & Elhawary, 2019). The Teaching and Learning International Survey (TALIS), (2018) supports these findings. The survey explored teachers' perspectives ICT integration and the factors that motivated them to accept and /or reject the integration. Findings of the report that professional development courses are, normally, structured to expand teachers' knowledge about the subject they teach and the

role of ICT in delivering the content meaningfully. Thus, the survey recognises professional development as one of these factors that have an influential role in enhancing teachers' ICT skills and enable them to integrate ICT into their teaching practices.

In Scotland, findings showed that professional development is referred to as Career-Long Professional Learning (CLPL) (Beck & Kennedy, 2018). Education organisations such as Education Scotland (ES), General Teaching Council for Scotland (GTCS), and HEIs use the acronym- CLPL- as it refers to the continuity of training courses and their effect on the development of teachers' pedagogical knowledge and technology skills (Livingston & Hutchinson, 2019; O'Brien, 2016; Watson & Michael, 2016). These organisations consider professional development as significant in the development of teacher's professionalism, ability, confidence, and expertise that enables them to support learning. They perceive CLPL as a supportive factor in the development of teachers' professionalism which develop their ability to employ critical-reflective approach to education. These findings align with Tannehill et al.'s (2021) study about professional development for PE teachers in Europe. The authors compared the CPD courses provided in 25 European countries who were members of the Erasmus programme. Findings revealed that Scotland is amongst the fourteen countries who provide compulsory professional development courses for primary and secondary school teachers. The study also revealed that local authorities and educational organisations (including universities) in Scotland facilitate these courses and fund them to ensure the development of teachers' teaching skills and to enhance their abilities to use ICT in the classrooms.

Secondary school teachers in Scotland receive several professional development courses about the different aspects of teaching and learning. These courses cover different issues such as subject content, teaching approaches, and the utilisation of ICT in teaching to enhance pupils' learning performance. Professional development courses scaffold secondary



school teachers with up-to-date information about contemporary trends in teaching and learning. ICT- specific enhance teachers' teaching skills and how to effectively integrate ICT in classroom activities that develop pupils' academic performance. These findings align with Livingston and Hutchinson's (2019) study about the effects of professional development programmes in Scotland on the development of teachers' ability to assess their pupils' needs to improve their learning. The study revealed empirical evidence that CLPL develop teachers' learning. The study suggests that CLPL can be successful if organised through "a dynamic framework" (p.290). This type of framework can provide teachers with customised training courses which considers their individual development needs.

The mechanism of the professional development courses is a further factor that supports secondary school teachers' efforts to integrate ICT in their pedagogical practices. During the probation year, it is mandatory for secondary school teachers to take a thirty- five hours training courses. This thirty- five hours training scheme is a result of the Donaldson's (2011) report that provides a number of recommendations about the development of teaching and learning. Donaldson considers teachers as the core agent of change who are able to reflect on learning and enhance pupils' academic outcomes (Beck & Adams, 2020). Afterward, this report formed an integral part of McCormac's review committee that reviewed teachers' employment agreements and how to support teachers' development. The review placed excessive emphasis on professional development for teachers and, thus, introduced the thirty-five hours scheme as an additional contractual element that enable teachers accessing several training opportunities. This scheme is consistent with the vision of the General Teaching Council for Scotland (GTCS) about professional development. GTCS considers these courses integral for teacher's Carrer-long Professional Learning (CLPL) and one of the essential requirements to become fully registered and qualified teachers. The GTCS states that professional development "describes the advanced professional knowledge

and pedagogical expertise that registered teachers will develop and maintain as they continue to progress in teaching and the education profession” (GTCS, 2012, p.4). Furthermore, the Scottish schools’ national intranet- *Glow*- enable provides teachers access to various online training courses (Wilson et al., 2020). Accessing these professional development courses is an opportunity for teachers at secondary education to pursue different training courses beyond time and location boundaries. These courses also enable them to accumulate proper knowledge about teaching elements, how pupils learn, and how ICT integration can fulfil the educational goals of the country.

## **5.5 Conclusion**

The present study investigated the experiences of secondary school teachers with ICT integration in their pedagogical practices in Egypt and Scotland. The study aimed to define a number of objectives: a) the motivating and hindering factors that affected secondary school teachers’ efforts to employ ICT in their teaching practices, b) how secondary school teachers perceived the role of ICT integration in developing their teaching practices, c) and the similarities and differences between Egypt and Scotland in integrating ICT at secondary education. Findings revealed that the success of ICT integration at secondary schools in both contexts depends on the provision of effective initial teacher education, reliable digital infrastructure at schools, and the continuous development of teachers’ skills in pedagogy and technology. Findings showed that these factors correlate to improve teachers’ understanding of ICT’s significant role in developing their pedagogical practices. These findings align with numerous studies that confirm the impact of these factors on the success and/or failure of ICT in enhancing teaching and learning (see for example: Brown et al., 2021; Lawrence & Tar, 2018; Fernández-Gutiérrez et al., 2020; Szymkowiak et al., 2021).

Participants in both contexts confirmed that they are aware of the significance of ICT in enhancing education quality. They note that the integration of ICT do not only develop

their teaching practices but can also improve pupils' learning outcomes (Zhou & Wei, 2018). However, Findings revealed that participants' experiences with ICT integration in Egypt varied from their counterparts in Scotland. In Egypt, factors such as overpopulated classrooms, instable internet connectivity, insufficient technical support, lack of ICT integration in the curriculum, and the security deficiencies of the *tablet* are demotivating factors that negatively affect their experiences with ICT integration. Findings showed that secondary schools in Egypt suffer from overpopulated classrooms. the current pupils to teacher ratio is (22-1) while a single classroom can accommodate an average of 41-60 pupils. Classrooms are equipped with state-of-the- art interactive boards and pupils have access to portable technology (i.e., *tablets*). However, the internet connectivity and power instability form persistent obstacles to teachers and hinder them on many occasions to utilise ICT in their teaching practices properly. Restrictions imposed on access to applications on these tools ( i.e., interactive boards/tablets) are additional barriers that hinders secondary school teachers from employing wide range of learning activities. The initial goal behind providing teachers and pupils at secondary schools with *tablets* is to shift from traditional text book learning to a full electronic learning, however this goal is not yet achieved. Pupils use *tablets* right now to access the platform for electronic final exams and teachers use it to correct these exams. Furthermore, curriculum at secondary schools still depends on traditional teaching and learning approaches while interactive learning activities are not embedded in it yet. All these factors restrict secondary school teachers in Egypt to benefit from the potential advantages of ICT integration at secondary education.

On the other hand, this is not the case in Scotland. The pupils to teachers ratio right now at secondary schools is 12-1. Classrooms are equipped with smartboards and portable technology such as iPads, laptops/Chromebooks. Internet speed and power source at these schools are stable and reliable. ICT is embedded into the Curriculum for Excellence (CfE)

which is Scotland's national curriculum. These issues enable secondary school teachers in Scotland to conduct interactive learning activities that scaffold pupils' knowledge of the content and help them being more independent and initiative-taking learners. Teachers are also able to employ pupil-centred approaches that support constructive learning and enable them to utilise ICT efficiently. These approaches enable them to conduct interactive learning activities regularly which, in return, enhance pupils' academic performance. Therefore, I can argue that ICT integration at secondary schools in Scotland helps in improving teachers' pedagogical practices and increases pupils' level of interactions.

Continuous professional development (CPD) is another factor that affects ICT integration in both contexts. CPD refers to training programmes and courses that teachers receive or will receive to develop their knowledge of the subject content, pedagogy strategies, and technology integration into education. Participants in both contexts were aware of their essential role in integrating ICT in their pedagogical practices. They confirmed that their pedagogical practices should reflect the national educational goals, concepts of learning activities and assessments, and perceptions of teacher- pupils relationship. They acknowledged that changing their pedagogical practices required the improvement of their subject knowledge, technology skills, and understanding the national goals behind ICT integration in education (Evens et al., 2018).

In Egypt, secondary school teachers consider the effectiveness of their role as teachers depends on them being well-trained and are able to utilise ICT as effective teaching tools to create interactive learning environment at classroom. They perceive the success of these CPD training courses depends on the provision of relevant and knowledge and practical experiences that can help them recognising the significance of ICT integration into their pedagogical practices and reshaping their teaching practices. They aim to receive CPD courses that can develop their pedagogical, content and technology knowledge. However,

findings showed that majority of CPD training courses in Egypt are not goal-oriented and theoretical in its essence. The lack of goal- oriented CPD courses and practical hands-on activities during these courses form a barrier for secondary school teachers in Egypt. These courses focus on providing secondary school teachers with theoretical knowledge in favour of practical aspect. Participants said that they preferred practical hands-on training through which they could gain productive knowledge about the best pedagogical practices that employ ICT in classroom. They also said that this type of professional development limited their ability to adopt and integrate ICT technologies in their teaching practices to shift from teacher-centred to student- centred approaches. They said that the structure of these programmes should focus on providing them with unmissable learning experiences that enable them to, successfully, employ ICT into their teaching practices. They further claimed that professional development programmes should have activities that encourage them to change their attitudes, beliefs, and perspectives of ICT and pedagogy.

Findings from Scotland, on the other hand, showed that CPD is an integral element in the development of secondary school teachers' teaching career. Secondary school teachers perceive CPD as a life-long learning approach that aim to improve, expand, and enhance their existing self- competencies and teaching capabilities (Bates & Morgan, 2018). Teachers at secondary education in Scotland receive relevant CPD training courses that develop their technology skills and enable them to integrate ICT in their teaching practices effectively. These CPD training courses are designed to develop their teaching capabilities before and after joining the teaching career as well. These courses enable them to enhance their pedagogical and technological skills, bring positive change into their teaching practices, and enhance learners' academic performance (Sims & Fletcher-Wood, 2021). These training courses also increase secondary school teachers' awareness of the current ICT policies, curricula updates, and enhanced their pedagogical and technological skills (Derakhshan et al.,

2020). Furthermore, CPD training courses enable them to accumulate knowledge about the role of educational technology in developing their teaching practices. Teachers are able to adopt more modern teaching approaches that utilise the interactive features and applications of ICT into teaching and learning activities that develops pupils' learning outcomes (Al Asmari, 2016).

Initial teacher education (ITE) in both contexts forms the corner stone in preparing aspiring teachers for their future teaching profession. It is the first step in building their future career in teaching that can develop their teaching practices and inform them how to use these tools to develop pupils' learning skills. Participants in Egypt and Scotland recognise the significant role of ITE programmes in scaffolding them with the required knowledge of the subject content, pedagogy theories, and the technology skills (Andreasen et al., 2022). However, findings from Egypt revealed that the ITE programmes suffer from outdated curriculum and short school placements. These two elements affect aspiring teachers' learning expectations and limit their ability to integrate ICT in their future teaching career effectively. ICT is not embedded in the curriculum and the main knowledge of ICT is about the operation of technology tools rather than developing pedagogy of technology. Faculties of Education are overpopulated and are not equipped with enough ICT facilities for pre-service teachers to practice using them in hands-on activities. School placements, which is the practical element of these programmes, is another factor that affect the efficiency of ITE programmes. The length of these placements do not provide pre-service teachers the opportunity to observe how expert teachers teach in real classrooms, how they manage classroom, and how they utilise ICT in their teaching practices.

In Scotland findings revealed that the Scottish government and the responsible organisations such as Education Scotland and the General Teaching Council of Scotland (GTCS) provide remarkable efforts to the reformation of ITE programmes that distinguishes

Scotland from the other nations of the UK (Adams, 2022). Findings confirmed that these organisations perceive ITE programmes as the primary source that provides aspiring teachers with opportunities to gain the required knowledge and skills to become effective teachers. Therefore, the structure and management of ITE programmes in Scotland differ entirely from those programmes in Egypt. ITE programmes in Scotland provide pre-service teachers with balanced theoretical knowledge and practical teaching experiences. The curriculum is up-to-date, and ICT is embedded in the different areas of the curriculum which is linked to secondary school curriculum. Furthermore, pre-service teachers have long schools placements that enable them to develop real teaching experiences and improved their ICT skills as well.

This study contributes to knowledge the following ways. The study at hand is, to the best of knowledge, the first study that compares ICT integration at secondary education in Egypt and Scotland. It is a comparative case study that aims to understand the unique experiences of secondary school teachers with ICT integration in their pedagogical practices in Egypt and Scotland. It is an attempt to understand how secondary school teachers adopt and utilise ICT in their pedagogical practices in developed nations with established educational frameworks and infrastructure and developing countries with significant socio-economic and infrastructure challenges. The study's comparative framework offers a nuanced perspective on how educational technology can either bridge or reinforce gaps in learning environments globally by comparing the ICT integration strategies, challenges, and outcomes in different contexts. It sheds light on the various ways that ICT is being used to improve educational outcomes in Egypt and Scotland. It provides insights into the various ways of adopting ICT in two different contexts to enhance educational outcomes as well as the challenges that teachers and policy makers confront as well. It further aims to close the gap in literature about comparative studies in secondary education in Egypt and Scotland.

Highlighting the difficulties that secondary school teachers have encountered and their achievements in integrating ICT in their teaching practices in both contexts provides basis for understanding how best practices could be modified for use in various educational contexts. This method shows that the usefulness of technology depends on the context and challenges the conventional "one-size-fits-all" perspective of ICT in education.

The comprehensive examination of teachers' initial education and professional development is another contribution of the present study as the first comparative study on ICT integration in secondary schools in Egypt and Scotland. The study perceives teachers as the main agent of change in the classroom, and the effectiveness of technology integration greatly depends on their proficiency and confidence at their ICT skills. The study shows that teacher readiness necessitates organised, ongoing, and context-appropriate professional development and is not solely dependent on the availability of digital devices or online resources. The study highlights particular gaps and potential for improving teacher competency in a variety of educational settings by contrasting the approaches to teacher preparation in Egypt and Scotland. One of the study's most important findings in Egypt is the lack of practical training, which leaves many teachers underprepared to use ICT effectively. According to the study, theoretical knowledge prioritise practical application in the Egyptian teacher training programmes, which undermines teachers' confidence and willingness to use ICT in the classroom. Although many teachers may be aware of the potential advantages of digital tools, they often lack the practical expertise, guidance, or support necessary to make good use of them. On the other hand, the Scottish approach of teachers' initial education and professional development provides insightful information about the value of ongoing training. In Scotland, Initial teacher education has been considered globally as one of the balanced programmes that provide pre-service teachers the opportunity to gain considerable theoretical and practical knowledge about teaching and learning. It also focuses on providing



pre-service teachers with the training and assistance they need to understand the significant role that ICT integration can play in the development of education. Continuous professional development (CPD) is a top priority in the Scottish educational system, which offers teachers frequent opportunities to advance their digital literacy, become knowledgeable about emerging technology, and experiment with creative teaching strategies. Once they join the teaching career, teachers receive plenty of professional development training that urge them to embrace pupil-centred approaches that employ ICT to improve critical thinking, collaborative learning, and interactive learning.

The analysis of ICT policies influence on ICT integration is a further distinctive contribution of this study. The study also offers a framework for developing long-lasting and significant ICT policy by highlighting the significance of customised strategies, fair access, and continuous support for teachers and pupils. The study shows the significant role of educational policies in shaping ICT integration at secondary schools in Egypt and Scotland, though the approaches are very different and have led to different levels of success and challenges. The study provides a comprehensive analysis of how ICT policies might be tailored to meet particular societal demands in different countries with different socioeconomic systems, educational systems, and ICT resources. The study shows that there are many obstacles that affect the accessibility and sustainability of ICT integration in Egypt, where the country's environment is shaped by a severe urban-rural split, budget constraints, and infrastructure limitations. The availability of resources and technical infrastructure have frequently been the focus of educational technology research, but this study emphasises that ICT initiatives and policy frameworks are also important in determining the effect of ICT integration on education development. ICT policies in Egypt are in place but frequently face implementation difficulties because of budget limitations. These policies frequently lack the fundamental support needed for long-term success, such as extensive teacher preparation and

training programmes, steady funding, and infrastructure development. The government's efforts in Egypt to incorporate ICT into education relied heavily on large-scale projects such as providing *tablets* to secondary school pupils and the Egyptian Knowledge Bank (EKB) which is an online digital repository of educational resources for teachers and pupils. Though the study concludes that these ICT initiatives in Egypt are significant, however they are of limited scope. Scotland, on the other hand, where the financial and infrastructure resources are more easily accessible. Difficulties are less complex and centre on problems such as socioeconomic differences in digital access, the requirement for ongoing professional development, and keeping up with quickly changing technology. Scotland benefits from a more organised approach to ICT policy, with programmes that provide priority to equal access to ICT , digital literacy, and teacher training. Scotland's Digital Learning and Teaching Strategy provides a comprehensive framework that offers continuous professional development to teachers and access to digital infrastructure for low-income pupils. Though there are still issues with resolving socioeconomic gaps, this policy guarantees that ICT programmes are more regularly implemented and accessible. The study's emphasis on policy as a significant factor in the successful integration of ICT is a useful contribution to the field.

The study provides evidence which indicates that in addition to technological resources, a strong and flexible policy framework that can be tailored to the particular requirements of any educational environment is also necessary for successful ICT integration. The study, therefore, highlights the significance of customised strategies, fair access, and continuous support for teachers and pupils as a framework for developing long-lasting and significant ICT policy. This cross-contextual perspective draws attention to the complex nature of ICT in education and emphasises how the same technology can produce completely different results. This viewpoint deepens the study of educational technology and increases our comprehension of the structural modifications needed to guarantee ICT efficacy in a

variety of contexts. By doing this, the study urges scholars, teachers, and policymakers to approach ICT more locally and with consideration for particular difficulties rather than implementing standardised approaches. This is to say that this study about ICT integration in Egypt and Scotland enhances the current knowledge of how technology can improve learning outcomes in a variety of contexts. Its conclusions show that although ICT can be an effective instrument for expanding access to information and developing critical digital skills, its effectiveness depends on a supportive ecosystem that consists of infrastructure, qualified educators, fair access regulations, and a pupil-centred learning philosophy. The comparative observations from this study can be employed by other countries pursuing ICT integration in their secondary education. The study informs policymakers that as technology continues to change the global educational scene, they should support fairness, diversity, and lifelong learning to enhance education quality.

## **5.6 Recommendations**

Findings of the present study confirm that integrating information and communication technology (ICT) into educational systems is significant in developing teaching and learning practices. It can provide teachers and pupils access to knowledge resources, improve their educational performance, and lays the basis for a workforce that is adept in digital technology. Based on the findings of the present research, I provide the below recommendations for policy makers in both countries. These recommendations address the critical policy issues such as initial teacher education programmes, digital infrastructure, and teacher training.

The successful integration of ICT in education starts in initial teacher education (ITE). ITE is the first step for aspiring teachers to understand the notion of teaching and learning. This early stage of teachers' preparation depends on providing them with effective ITE programmes that help them recognising the significant role of ICT in developing their

pedagogical practices. The goal of these programmes, therefore, should emphasis on equipping pre-service teachers with the required knowledge of the subject content, pedagogical issues and technology skills as well. Prioritizing theoretical knowledge over practical training affects pre-service teachers' ability to employ pupil-centred learning approaches in their future teaching career. It also limits in-service teachers' ability to develop pupils' cognitive skills such as critical thinking and problem-solving. Therefore, stakeholders at the Ministry of Education and Technical Education (MoETE) and the Ministry of Higher Education and Scientific Research (MoHESR) in Egypt should consider reform plans to restructure the current initial teacher education programmes (ITE). The emphasis of curriculum at these programmes should be diverted from focusing mainly on theoretical knowledge of pedagogy and subject content to a more holistic approach that balances between theory and practice. ICT should form an integral part of the curriculum and not a stand-alone module that prioritizes theoretical knowledge and provides modest and insufficient practical activities. Faculties of education should be equipped with enough ICT tools and reliable internet connection to help pre-service teachers become familiar with the features of these tools and how to employ them in learning activities. These programmes is the corner stone in preparing pre-service teachers for the challenging educational needs of pupils. Policymakers should also consider long school placements in the proposed structure of these programmes. These school placements provide pre-service teachers the opportunity to practically implement the theoretical knowledge and gain deep understanding of teaching practices from expert teachers. These programmes should also enable pre-service teachers to practice the use of ICT in delivering the curriculum. Policymakers should also consider expanding ITE programmes beyond faculties of education. Considering subject-specific faculties such as faculties of arts, commerce, and science as essential route of recruiting teachers could enrich the scope of initial teacher education. Also, restructuring the current

Post Graduate Diploma of Education (PGDE) to a more practical model could equip pre-service teachers with efficient pedagogical knowledge, enhanced ICT skills, and long school placements to practice teaching in real classrooms. It should also reduce the current inconsistent integration of ICT into the curriculum of these programmes, produce well-equipped teachers with technology, and enhance their ability to employ innovative teaching and learning approaches.

School infrastructure is one of the persistent challenges that policymakers in Egypt should address to support the continuity of ICT integration. In Egypt, secondary schools suffer from overpopulated classrooms, shortage of school buildings as well as low or limited internet capacity. Overpopulated classrooms on one hand restrict teachers' ability to conduct ICT learning activities or utilise mobile technology such as the *tablet* in their teaching practices. Policymakers, therefore, should allocate further financial resources to increase the number of secondary school buildings. This will help reducing the current ration of pupils-to-teachers ratio which is 41-1. This will also help secondary schools meet the increased number of pupils joining secondary education yearly. Reliable access to technology is the cornerstone of ICT integration. Policymakers in Egypt need to place further investments to upgrade the current digital infrastructure of secondary schools , particularly in underserved and rural areas. Broadband internet development might be given top priority by national initiatives, guaranteeing that secondary schools have access to fast, reasonably priced connectivity. They should increase the allocated budgets to secondary school to enable school administrators expanding the internet capacity that ensure the stability of the internet connection. This should improve the quality of education and enhance pupils' cognitive skills. Teachers will be able to observe the development of pupils' learning, provide tailored learning activities to pupils of low level, and increase their level of engagement with other peers.

Professional development (i.e., CLPL/CPD) is a lifelong process that aims to provide teachers with an opportunity to improve their teaching skills across the course of their teaching career. The lack of confidence and proficiency among secondary school teachers in utilising ICT properly is a major obstacle to the adoption of ICT at secondary education in Egypt. In order to guarantee that all secondary school teachers receive thorough training in ICT pedagogy, policy makers should consider professional development programmes as top priority. ICT should not be seen as an aiding tool that teachers at secondary education can employ in traditional teaching methods, but they should recognise it as an integral component of constructive teaching practices. Policymakers, therefore, should develop a more organised and thorough professional development strategy that emphasises on providing teachers with continuous professional development courses to develop their teaching skills and digital pedagogy as well. They should organise workshops that enable teachers to understand how to employ digital tools, virtual learning environments, and interactive boards in constructive learning activities. These workshops should focus on incorporating ICT resources in teaching and learning activities rather than focusing on developing teachers' technical abilities. These workshops should not only develop teachers' technical skills in operating these tools or handling possible troubleshoots, but how to employ the features and applications of these tools in the delivery of the subject content effectively. Furthermore, professional development should not be limited to a specific form of delivery. Rather, it should be available to teachers without boundaries to help them benefit from these courses whenever, wherever, and however they feel it suits their individual needs. Furthermore, policy makers should expand the role of the Egyptian Knowledge Bank (EKB) from being a repository to an online professional development platform. This can help teachers access variant online training materials and resources such as interactive training sessions, webinars, and peer-to-peer learning opportunities.

The real value of ICT integration lies in its ability to change teachers' classroom practices to be more pupil-centred and make learning more dynamic and interesting. Policy makers should provide school administrators with enough resources and clear policy guidelines to support teachers' efforts in integrating ICT in their classroom practices. The clear guidelines of ICT policy enable teachers to employ ICT into the different areas covered in curriculum of secondary education. These guidelines should enable teachers to know how to employ ICT in the classroom to facilitate project-based learning and enable pupils using these digital tools to solve real-world problems. This way, teachers can increase pupils' collaboration to work together on coding projects to develop learning games and Apps. Policy makers should also facilitate Virtual laboratories at secondary schools. These laboratories can help secondary school teachers conducting online simulations of biology, chemistry, and physics experiments instead of conducting them in real laboratories that can be risky, expensive and resource-intensive. These experiments can provide pupils with practical and safe experience and assist their counterparts in remote areas who may not have access to physical science laboratories.

In Scotland, policy makers should consider further improvement of the current initial teacher education programmes (ITE) to help pre-service teachers enhancing their theoretical and practical skills. They should consider the expansion of school placements in diverse schools and adopt structured mentorship. Expanding the current school placements provides pre-service teachers with prolonged teaching experiences that can increase their teaching competence, develop their classroom management skills, and enhance their self-confidence in ICT skills as well. School placements should not be limited to specific areas. Policy makers should encourage pre-service teachers to have these placements in diverse schools across the urban and rural areas. This variety enables pre-service teachers an opportunity to observe how teachers in different teaching settings employ ICT in their teaching practices. It also

helps them recognising the cultural differences and the diverse needs of pupils at different schools. Structured mentorship is a further element that policymakers should consider in developing ITE programmes. This type of mentorship is a collaboration between experienced school-based teachers and university tutors to provide pre-service teachers with meaningful teaching experiences in real classroom. This concept ensures that each pre-service teacher has access to well-trained mentors who are able to guide them during the period of the school placement. It is a type of systematic support through which experienced teachers cooperate with university tutors to ensure that pre-service teachers receive adequate mentoring that leads to the improvement of their teaching experiences.

Digital equity in Scotland is one of the persistent issues at secondary education that policy makers should address. Though digital infrastructure in most secondary schools around Scotland can be described as consistent and reliable, however remote and underserved areas face challenges in regard to internet connectivity and the provision of portable devices. Scotland has high rates of internet penetration and device ownership, however not all pupils around Scotland have equal access to ICT. Policymakers should address these disparities to guarantee that every pupil has access to ICT resources. They should allocate further investments to develop the digital infrastructure of secondary schools particularly those at remote and underserved areas. They should also adopt ICT initiatives to enhance internet connectivity in these areas to close this gap. This can be achieved by boosting broadband connectivity for low-income families, extending access to community technology centres, and providing digital devices to pupils they can use at school and to take home. Furthermore, policy makers may potentially look into offering low-income households subsidised internet in order to enable pupils to continue their digital education outside of the classroom.

CPD for in-service teachers is an essential component in the development of teachers' pedagogical and technological skills. CPD also enables teachers to recognise the significant



role of ICT in supporting their adoption of constructive approaches for effective teaching. Therefore, policymakers in Scotland should implement a holistic strategy to improve teachers' professional development to sustain the country's educational objectives and utilising innovative technologies to bridge gaps that may exist. They should establish a comprehensive framework that outlines the necessary digital skills for teachers at various career phases. Competencies such as using digital learning platforms, managing data, conducting online assessments, and producing digital material should all be included in this framework. In line with Scotland's educational aims, this framework would assist teachers in identifying and cultivating particular digital abilities. Policy makers should provide in-service teachers with customised training courses that address their career goals to enhance their teaching professionalism at the different stages of their careers. They should also provide them with flexible options to participate in online training courses on digital platforms that offer a variety of learning modules and webinars. This method can help teachers learning on their own pace and fit into their personal commitments and work schedule while also empowering their professional development. Furthermore, policy makers should provide teachers with training courses about emerging technologies that can improve pupils engagement and customise learning experiences, such as gamification, virtual reality, and artificial intelligence.

## **5.7 Study Limitations**

The present study investigated teachers' experiences with ICT integration in their pedagogical practices as well as the factors that affect the success or failure of ICT integration. While the present study aimed to provide comprehensive description of teachers' perspectives of the significance of ICT integration, there are a number of limitations to be addressed.

The Covid-19 pandemic presented a number of challenges that have affected the present study. The study was conducted during these unprecedented circumstances that have resulted in severe life conditions all over the world. Schools were locked and teachers had to teach online to help pupils continuing their learning. This issue limited the researcher's access to the study participants. It was impossible to visit schools to interview the participants and observe how they use ICT in the classroom. Observation in qualitative research enables researchers to study the phenomenon in its context. Inability to observe how participants integrate ICT in classroom did not enable the researcher to record participants' perspectives of it, and how they manage it. The pandemic also imposed telephoning interviews instead of face-to-face mode. The lockdown restricted the social and educational life activities. People were locked in their homes and had to work remotely. One of the characteristics of face-to-face interviews is that they enable researchers to interact directly with participants and recognise their face gestures and body language as they react to the interview questions. These reactions can be interpreted into further data to enrich the study findings. The size of the sample is another limitation to this study. It is one of the drawbacks of qualitative studies. Qualitative queries tend to select small number of participants with specific characteristics to explore the phenomenon. This type of the sample size may not be a representative of the population and may not allow the generalisation of the findings to the entire population. However, the present study has its own strengths as well. The present study is an in-depth investigation of teachers' experiences with ICT integration in teaching and learning and its effect on education development. This type of study provides deep understanding of the phenomenon from the lens of the participants and enables the audience to form a holistic view of the topic. It explains in details teachers' practices in classroom and how they manage to use ICT in teaching and learning. It also details the factors that teachers perceive as barriers to ICT integration or opportunities to a successful integration.

## **5.8 Further Research**

The present study, to my best knowledge, is the only study that compares teachers' experiences with ICT integration in Scotland and Egypt. Though Scotland forms a part of the United Kingdom (UK), the Scottish education system is distinct from other nations of the UK (i.e., England, Wales, and Northern Ireland). It holds an international reputation and has inspired other countries to adopt it. Therefore, it is beneficial to conduct further qualitative and /or longitudinal studies about ICT integration in the Scottish education system and compares it with other countries that integrate and /or plan to integrate ICT into their educational systems. These studies can investigate Scotland's experiences in integrating ICT in deprived and /or remote areas and how it helped in the development of teaching and learning. Furthermore, it can be significant to investigate the role of Senior Leaders teams (SLTs) in facilitating ICT integration. These studies could inform stakeholders about the deficiencies in their systems and help them remedy them or even transfer the whole practices to their local educational system.

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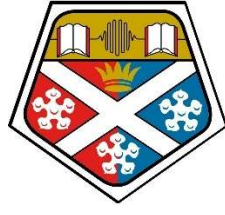
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## APPENDICES

### Appendix 1: Participants Information Sheet- Arabic

#### معلومات المشاركة في بحث أكاديمي

عنوان الرسالة : دراسة مقارنة عن دمج مدرسي التعليم الثانوى للتكنولوجيا ا في ممارساتهم التربويه

في مصر واسكتلندا

عزيزى المشارك/ عزيزتى المشاركة

أنت مدعو/ مدعوه للمشاركة في دراسة بحثية كما هو مذكور في عنوان الدراسة أعلاه. قبل أن تقرر / تقرري المشاركة، من المهم أن تفهم / تفهمي لماذا يتم إجراء البحث وما سيتضمنه. يرجى قراءة المعلومات التالية بعناية ومناقشتها مع الآخرين إذا كنت / كنتى ترغب / ترغبين في ذلك. يرجى أن تسألني/ تسأليني إذا كان هناك أي شيء غير واضح أو إذا كنت ترغب / ترغبين في مزيد من المعلومات... شكرا جزيلا.

#### ما هو الغرض من هذا البحث ؟

يهدف هذا البحث إلى دراسة كيفية إدراك المعلمين في مصر واسكتلندا لفرص دمج تكنولوجيا المعلومات والاتصالات في ممارساتهم التربوية في الفصول الدراسية والحواجز التي قد تعوق هذه العملية. ويهدف إلى إطلاع المعلمين على الدور الذي يمكن أن تؤديه تكنولوجيا المعلومات والاتصالات في تغيير ممارساتهم التربوية الحالية وطريقتهم في تكوين المعرفة المتعلقة بالمواضيع الدراسية من خلال اعتماد طرق تعليمية غير تقليدية يمكن أن تغير دورهم من معلم تقليدي يركز على المعلمين كناقلين للمعرفة إلى ميسرين لها. إذا اقتنع المعلم، سيكون قادراً على اختيار واعتماد وتشغيل أدوات تكنولوجيا المعلومات والاتصالات المفيدة التي تساهم بشكل إيجابي في أنشطة التدريس/التعلم اليومية في الفصول الدراسية لزيادة الفعالية الذاتية للطلاب، وتحفيز الطلاب وزيادة مشاركتهم في الأنشطة الصفية، وتحسين تعلمهم.

**هل يجب أن تشارك؟**

إن مشاركتك في المقابلات طوعية و يمكنك الانسحاب في أي وقت قبل تشفير بيانات المشاركين وبدء تحليل البيانات حيث يتعذر بعد ذلك تحديد بياناتك أو ما أدليت به من تفاصيل أثناء المقابلة.

**ما هو المطلوب منك في الدراسة؟**

بمجرد أن تقرر /تقرري المشاركة في هذا البحث، سيُطلب إجراء مقابلة لمدة 45 إلى 60 دقيقة عبر الهاتف.

**لماذا تمت دعوتك للمشاركة؟**

يتطلع الباحث إلى معرفة تجربتك وأفكارك في استخدام تكنولوجيا المعلومات والاتصالات في الممارسات اليومية للفصل الدراسي وكيف تمكنت / تمكنتي من استخدامها بكفاءة لتقديم محتوى المنهج وما هي الدوافع و المعوقات لدمج تكنولوجيا المعلومات والاتصالات في التعليم.

**ما هي المخاطر المحتملة عليك أثناء مشاركتك في الدراسة؟**

لا يُتوقع حدوث أي ضرر أو خطر من خلال المشاركة في هذه الدراسة، ولا توجد متطلبات تحضيرية للمقابلات.

**ماذا سيحدث للمعلومات الواردة في الدراسة؟**

بعد الانتهاء من المقابلات، سيتم إخفاء هويتك بالكامل، وسيتم إيداع أسئلة المقابلة والنصوص على خوادم حواسيب الجامعة من قبل المشرفين لمدة تصل إلى 5 سنوات بعد الانتهاء من هذه الدراسة. سيتم نشر البيانات وتقديمها في الاجتماعات العلمية والأدبيات البحثية بدون إظهار هوية المشترك. ولن تستخدم هذه الدراسة المعلومات التي يمكن التعرف عليك من خلالها.

**ماذا سيحدث بعد ذلك؟**

إذا كنت/كنتي راغب/راغبة في المشاركة في الدراسة، يمكنك التوقيع على إقرار الموافقة بالمشاركة واستخدام إجاباتك في المقابلة للأغراض التي تخدم هذه الدراسة. إذا كنت ترغب /ترغبين في الحصول على نسخة موجزة من نتائج البحث بعد الانتهاء من الدراسة ، يمكنك الاتصال بالباحث أو المشرف الأول مع الأخذ في الاعتبار أن نتائج البحث قد تستغرق أكثر من عام لتكون جاهزة لعرضها على المشاركين.

وفي حال قررت/قررتي عدم المشاركة في الدراسة ، فإننا نشكرك على اهتمامك.

تفاصيل الاتصال بالباحث

**Researcher's contact details:**

Mohamed Ibrahim

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University of Strathclyde

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تفاصيل الاتصال بالمشرف الأول

**Chief Investigator details:**

Professor: Ian Rivers

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Scotland

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وقد منحت لجنة أخلاقيات البحث العلمي في جامعة ستراثكلاید هذا البحث موافقة أخلاقية. إذا كان لديك أي أسئلة أو مخاوف، أثناء البحث أو بعده، أو ترغب في الاتصال بشخص مستقل قد توجه إليه أي أسئلة أو ترغب في طلب مزيد من المعلومات منه، يرجى الاتصال بـ:

**School of Education Ethics Chair**

Dr. Eugenie Samier

Reader

School of Education - Faculty of Humanities & Social Sciences

Lord Hope Building

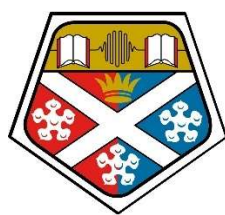
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## **Appendix 2: Participants Information Sheet – English**

### **Participants Information Sheet**

#### **Research Title: A comparative study of secondary school teachers' integration of ICT into their pedagogical practices in Egypt and Scotland**

Dear Participant

You are invited to take part in a research study. Before you decide it is important for you to understand why the research is being done and what it will involve. Please take the time to read the following information carefully and discuss it with others if you wish. Please ask me if there is anything that is not clear or if you would like more information. Thank you for reading this.

#### **Introduction:**

The aim of permanent or life-long learning is to provide learners of all ages with continuous education and proficient training to help them update their knowledge, skills and competency. Permanent learning is more student- centered than teacher-centred learning. It focuses on the development of student's competency in learning by providing them proper education technology tools (for example: smart boards, ICTs, TV, DVDs and Videos) to manage their learning and become more independent in searching, processing and assessing proper information that help them increase their knowledge about the taught courses.

**What is the purpose of this investigation?**

The purpose of the present research is to investigate the role of technology in developing education. The research will conduct a comparative analysis of teacher's perception of using ICT in pedagogical practices in Scotland and Egypt. It will explore how the integration of ICT in education could or has enabled teachers to shift from traditional ways of teaching (i.e. Teacher-centered) to more advanced strategies due to the interactivity and vibrancy of these tools.

**Do you have to take part?**

Your participation is voluntary. You are able to withdraw from the study at any point, up until the data is anonymized. If you decide to withdraw from this study, your data will be deleted, and it will not be used. Withdrawal from the study after data is anonymized is not possible since we will no longer be able to identify your responses.

**What will you do in the project?**

After you choose to participate in this research, you will be asked to sit for an interview for about 45 minutes.

**Why have you been invited to take part?**

Researcher is looking to hear about your experience and thoughts of using ICT in classroom daily practices and how you were able to use them efficiently to deliver subject content and what are the motivations and barriers to integrate ICT in education.

**What are the potential risks to you in taking part?**

No harm or risk is expected through participating in this study, and there are no preparatory requirements for the interviews.



**What happens to the information in the project?**

After finishing the interviews, your data will be completely anonymised, and the interview questions and scripts will be deposited on the University servers by the investigators for up to 5 years after the completion of this study. Anonymised data will be published and presented in scientific meetings and literature. This study will not use information where you can be identified.

The University of Strathclyde is registered with the Information Commissioner's Office who implements the Data Protection Act 1998. All personal data on participants will be processed in accordance with the provisions of the Data Protection Act 1998.

Thank you for reading this information – please ask any questions if you are unsure about what is written here.

**What happens next?**

If you are happy to be involved in the project, you may sign the informed consent for your responses to be used in this study to confirm this. If you want to receive a brief copy of the research results after the investigation is completed, you may contact researcher or chief investigator, although the research outcomes may take over a year to be ready for reporting. If you decided not to involve in the project, we would thank you for your attention.

**Researcher's contact details:**

Mohamed Ibrahim

PhD student, School of Education

University of Strathclyde

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[boghdady.mohamed@strath.ac.uk](mailto:boghdady.mohamed@strath.ac.uk)

**Chief Investigator details:**

Professor: Ian Rivers

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This investigation was granted ethical approval by the University of Strathclyde Ethics Committee.

If you have any questions/concerns, during or after the investigation, or wish to contact an independent person to whom any questions may be directed or further information may be sought from, **please contact:**

**School of Education Ethics Chair**

Dr. Eugenie Samier, Reader

School of Education - Faculty of Humanities & Social Sciences

Lord Hope Building

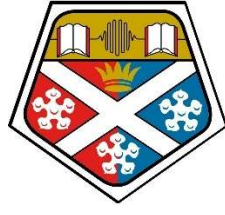
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### Appendix 3: Consent Form- Arabic

#### إقرار بالموافقة

جامعة ستراث كلايد، كلية الدراسات الإنسانية والعلوم الإجتماعية

عنوان الرسالة : دراسة مقارنة عن دمج مدرسي التعليم الثانوى للتكنولوجيا ا في ممارساتهم التربويه

في مصر واسكتلندا

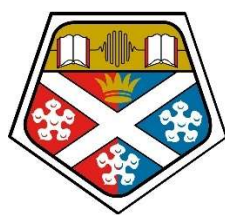
أؤكد أنني قرأت وفهمت ورقة معلومات المشاركة بالبحث المذكور أعلاه وأن الباحث أجاب على كل استفساراتي.

- أنا أعلم أن مشاركتي طوعية وأنتي حر في الانسحاب من البحث في أي وقت، قبل تشفير البيانات وبدء تحليلها، دون الحاجة إلى إعطاء سبب ودون أي عواقب.
- أنا أعلم أنه يمكنني طلب سحب بعض المعلومات الشخصية من البحث وأنه كلما كان ذلك ممكناً سيتمثل الباحث لطبي. ويشمل ذلك البيانات الشخصية التالية:
- التسجيلات الصوتية للمقابلات التي تحدد هويتي.
- معلوماتي الشخصية من سجلات المقابلات.
- أنا أعلم أنه لا يمكن سحب البيانات المشفرة (أي البيانات التي لا تحدد هويتي) بمجرد تضمينها في الدراسة. أنا أعلم أن أي معلومات مسجلة في البحث ستظل سرية ولن يتم توفير أي معلومات تحدد هويتي للقراء أو الباحثين .
- أوافق على أن أكون مشاركاً في البحث. أوافق على أن يتم تسجيل صوتي أثناء المقابلات وفقاً لمتطلبات البحث.

التوقيع

الإسم

التاريخ:



**University of  
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**Humanities &  
Social Sciences**

**Appendix 4: Consent Form- English Consent Form**

**University of Strathclyde, Faculty of Humanities and Social Sciences**

**Research Title: A comparative study of secondary school teachers' integration of  
ICT into their pedagogical practices in Egypt and Scotland**

I confirm that I have read and understood the information sheet for the above project and the researcher had answered any queries to my satisfaction.

- I understand that my participation is voluntary and that I am free to withdraw from the project at any time, up to the point of completion, without having to give a reason and without any consequences. If I exercise my right to withdraw, and I do not want my data to be used, any data which have been collected from me will be destroyed.
- I understand that I can withdraw from the study any personal data (i.e. data that identify me personally) at any time.
- I understand that anonymised data (i.e. data that do not identify me personally) cannot be withdrawn once they have been included in the study.
- I understand that any information recorded in the investigation will remain confidential, and no information that identifies me will be made publicly available.
- I consent to be a participant in this interview.

(PRINT NAME)	
Signature of Participant:	Date:



# University of Strathclyde

## Humanities & Social Sciences

### Appendix 5: Interview Schedule- Arabic

#### الدور والمهام

- 1- ماهى المادة التى تدرسها حاليا ؟
- 2- منذ متى وانت تعمل فى مجال التدريس؟
- 3- ما رأيك فى التكنولوجيا على المستوى الشخصى؟
- 4- هل تستخدم أدوات تكنولوجيه مثل الهواتف الذكية الكمبيوتر اللوحة أو الكمبيوتر المحمول فى حياتك اليومية؟
- 5- منذ متى وانت تستخدم تلك الأدوات؟

#### البنية التحتية للمدرسه

- 6- ما نوع الأدوات التكنولوجيه المتوفره فى مدرستك؟ ( أقصد الكمبيوترات العادية أو المحموله أو السبورات الذكية أو جهاز العرض على الشاشة).
- 7- ما نوع الإنترنت المتوفر فى المدرسة التى تعمل بها؟ وكيف يمكنك الولوج إليه؟
- 8- هل درست أي دورات عن التكنولوجيا أثناء دراستك الجامعيه؟ إذا كان كذلك ماذا كان مضمون تلك الدورات؟
- 9- هل ساعدتك تلك الدورات على استخدام التكنولوجيا فى التدريس داخل الفصل؟
- 10- هل تعتقد أن دمج التكنولوجيا فى التعليم قد يساعد فى تطوير طريقة تدريسك؟
- 11- هل خبرتك السابقه فى استخدام التكنولوجيا أثرت على رأيك فى دمج التكنولوجيا بالتعليم؟
- 12- هل حصلت على دورات تدريبيه تتعلق بالتكنولوجيا بعد التحاقك بالتعليم؟
- 13- هل ساعدتك تلك الدورات التدريبيه على إدراك أهميه دمج التكنولوجيا فى التعليم؟

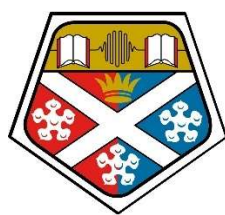
#### الممارسات التعليميه

- 14- ما نوع الأنشطة التعليميه المدمج فيها التكنولوجيا التى تستخدمها فى تدريس المنهج؟
- 15- ما مدى استخدامك لتلك الأنشطة فى نشاطات التدريس بشكل يومى؟
- 16- هل لك أن تحدثنى عن أحد الدروس أو الأنشطة التعليميه التى قمت بتدريسها باستخدام التكنولوجيا؟
- 17- ماذا كان الهدف العام من استخدام التكنولوجيا فى هذا الدرس أة النشاط التعليمي؟
- 18- هل تعتقد أنك قمت بتدريسه هذا الدرس أو النشاط بالشكل المطلوب؟
- 19- هل تعتقد أنه كان يمكنك تدريس بعض أو كل الدرس بشكل تراه مختلف أو أفضل؟

#### معوقات الدمج الالكترونى

- 20- ما هى المعوقات التى تعيق عملية دمج التكنولوجيا فى التعليم من وجهة نظرك؟

21- ما هي عوامل النجاح التي تساعد على نجاح عملية دمج التكنولوجيا في التعليم من وجهة نظرك؟  
شكرا جزيلا على مشاركتك.



**University of  
Strathclyde**  
**Humanities &  
Social Sciences**

## **Appendix 6: Interview Schedule- English**

### **Roles and Responsibilities**

1. What subject do you teach?
2. How long have you been in the teaching career?
3. What do you think of technology?
4. Do you use any technology tools like smart phones, tablets, laptops or iPads in your daily activities?
5. How long have you been using it/them?

### **School Infrastructure**

6. What kind of ICT tools available in your school/classroom? (i.e, computers, laptops, smartboards, overhead projectors. etc)
7. What type of internet connection available at your school? How do you access it?

### **Professional Development**

8. While studying at college/university, did you take any ICT courses? If so, what was the main focus of them?
9. If you had experience of ICT courses during your initial training, have they helped you to use ICT in your classroom?
10. Do you think ICT integration important for your practice?
11. Has your previous experience of ICT shaped this?
12. Have you experienced any professional learning focused on ICT during your teaching career once you had become qualified?
13. How have these courses enabled you to perceive the usefulness of ICT integration?

### **Pedagogical Practices**

14. What kind of ICT based activities do you use to deliver the curriculum?
15. How do you make use of them in your daily teaching practice?
16. Can you tell me about a lesson or an activity you delivered with ICT?

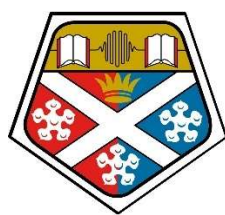
17. What was the overall purpose for using the ICT for this lesson /activity?
18. Do you think it was delivered properly?
19. Is there anything that should have been done differently?

**Integration Barriers**

20. What do you think are the barriers of adopting ICT in the classrooms?
21. What do you think are the facilitators of adopting ICT in classroom?

Thank you very much for your participation.





**Appendix 7 : List of final codes and their definitions**

Theme	Sub- Theme	Codes
<b>Access and Engagement</b>	<b>Initial Teacher Education</b>	learning tools and teaching approaches
		curriculum planning
		education technology in theory
		school placements are very short
		We teach one day/week over 30 weeks at placements
		PGDE is not part of the study plan at faculty of education or subject specific degree
		school placements only for faculty of education
		Modules of education policies and pedagogical approaches
		PGDE is a requirement for teaching
		PGDE is a one-year teaching degree
		PGDE is more condensed with teaching at schools
		Online and in- class courses about education technology tools

	<b>CPD</b>	training courses were mainly theoretical
		developing teacher's teaching methods than improving technology skills
		training sessions on the use the interactive board.
		mandatory CPD training
		training courses of pedagogy
		courses in learning and teaching
<b>Pedagogical Practices</b>	<b>Teaching Approaches</b>	cooperative learning approach
		communicative teaching approach
		brainstorming, then conduct a discussion with students
		useful for students' different learning needs
		using the interactive board in teaching
		use features and Apps to deliver lesson content
		difficult to implement modern teaching approaches
		Overcrowded classrooms
		curriculum is designed on memorization
		student- led approaches
		whole class instruction approach
		assessment approach

		collaborative learning
		engage students in their learning
		a desktop computer connected to an overhead projector and a smart board
		interactive touch screen boards
		a maximum of 20 students in classroom
	<b>Believes and Attitudes</b>	Manahel Al Maarifah multimedia suite.
		used it very limited times
		No chance to use the multimedia during placements
		interactive boards in classrooms
		internet access
		the positive effect on students
		useful in teaching
		students' interaction increased
		crowded classrooms are not easy to manage
		cannot deliver teaching properly
		difficult to use the interactive board
		do not use the tablet in teaching
		features are not activated on the tablet
		access the knowledge bank
		perform final exams
		quality of the training

		theoretical courses and inexperienced trainers
		a desktop to project lessons smartboard
		interactive touch screen boards and laptops
		twenty to twenty-five students
		classroom can be manageable
		going round to help students individually
		enhance students' learning
		different courses that support students' mental health and IT training courses
		how to use different educational Apps on the iPad
		With iPad, students are leading their learning
		more responsible for their own learning and more engaged in their learning.
		technology is portable and give children the skills for life
		current courses train are distinguished
		focus on developing teaching capabilities
		use modern strategies for learning
		benefit from technology in developing education
		use the tablet, and ICT in modern education

	<b>Confidence</b>	Interactive board increased students' attention
		students were distracted, bored and even asleep
		convince hesitant teachers to use technology
		Covid-19 forced reluctant teachers to use technology
		get training about the use of a smartboard
		training courses about subject area
		training program about how to use smartboard
		course about how to use Apple teacher for iPad
		Technology make the big difference
		iPads are handy
		students engagement
		have ownership of their learning.
		students' ability to develop their creativity skills
		get access to what they need at home
		provided secondary schools with interactive boards
		great substitute for the multimedia suite

<b>School Environment</b>	<b>ICT Policy</b>	helps me to use technology more
		internet connection is not strong
		considerable number of users
		curriculum content is not related to test questions
		smartboard has become an additional burden
		Focus on paper work
		limited usage of the tablet
		no connection between students and teachers' tablet
		testing platform
		developing curriculum to support students' creative and critical thinking
		iPad, a desktop computer, a projector, and a smartboard.
		Apple TV on smartboard to project iPad screen
		connection is reliable and never really cuts off
		make virtual classroom
		lesson resources at Microsoft Teams that students need
		learn at their own pace

		give instant feedback
	<b>Support</b>	technology development department
		technician
		limited budget
		Tablet's security system was fragile
		many students use it as gaming console
		distracted their attention
		a decline in their academic level
		telephone help line
		technician
		assigned maintenance company
		have always got internet
		security measurements for internet access

## Appendix:8 Ethics Application Form

Please answer all questions

### 1. Title of the investigation

**A comparative study of ICT integration at secondary education in Egypt and Scotland**

Please state the title on the PIS and Consent Form, if different:

### 2. Chief Investigator (must be at least a Grade 7 member of staff or equivalent)

Name: IAN RIVERS

☒ Professor

☐ Reader

☐ Senior Lecturer

☐ Lecturer

☐ Senior Teaching Fellow

☐ Teaching Fellow

Department: SCHOOL OF EDUCATION

Telephone: +44 (0) 141 444 8362

E-mail: [ian.rivers@strath.ac.uk](mailto:ian.rivers@strath.ac.uk)

### 3. Other Strathclyde investigator(s)

Name: ANNA BECK

Status: Lecturer in Teaching Professional Learning

Department: School of Education

Telephone: +44 (0)141 444 8081

E-mail: [anna.beck@strath.ac.uk](mailto:anna.beck@strath.ac.uk)

Name: STAVROS NIKOU

Status: Lecturer in Digital Education

Department: School of Education

Telephone: +44 (0)141 444 8198

E-mail: [Stavros.nikou@strath.ac.uk](mailto:Stavros.nikou@strath.ac.uk)

Name: MOHAMED IBRAHIM

Status (e.g. lecturer, post-/undergraduate): Postgraduate Research Student

Department: School of Education



Telephone: +44 (0) 77 6191 1305
E-mail: <a href="mailto:boghdady.mohamed@strath.ac.uk">boghdady.mohamed@strath.ac.uk</a>

#### 4. Non-Strathclyde collaborating investigator(s) (where applicable)

Name:  
Status (e.g. lecturer, post-/undergraduate):  
Department/Institution:  
If student(s), name of supervisor:  
Telephone:  
E-mail:  
Please provide details for all investigators involved in the study:

#### 5. Overseas Supervisor(s) (where applicable)

Name(s):  
Status:  
Department/Institution:  
Telephone:  
Email:  
I can confirm that the local supervisor has obtained a copy of the Code of Practice: Yes  
☐ No ☐  
Please provide details for all supervisors involved in the study:

#### 6. Location of the investigation

At what place(s) will the investigation be conducted:  
The data gathering will be in both Scotland and Egypt while data analysis will be conducted in Strathclyde premises in Scotland.  
In Scotland, the research will conduct the interviews at Strathclyde premises. In Egypt, participants will be interviewed at their place of work (i.e. schools); either at teachers' room or a quiet place at the school café, if available.

If this is not on University of Strathclyde premises, how have you satisfied yourself that adequate Health and Safety arrangements are in place to prevent injury or harm?  
If participants will not be able to attend interviews at the aforesaid location(s), upon mutual understanding researcher will look for another place that has proper health and safety requirements to conduct the interviews or can ask participants to suggest another place they are familiar with. Researcher will visit the place first to make sure it has the proper health and safety requirements to prevent injury or harm to participants.

#### 7. Duration of the investigation

Duration(years/months): 1 Year (data collection and analysis)

Start date (expected): 01 /03 / 2020                      Completion date (expected): 01/09 / 2020

### 8. Sponsor

Please note that this is not the funder; refer to Section C and Annexes 1 and 3 of the Code of Practice for a definition and the key responsibilities of the sponsor.

Will the sponsor be the University of Strathclyde: Yes ☒ No ☐

If not, please specify who is the sponsor:

### 9. Funding body or proposed funding body (if applicable)

Name of funding body:

Status of proposal – if seeking funding (please click appropriate box):

☐ In preparation

☐ Submitted

☐ Accepted

Date of submission of proposal:        /        /        Date of start of funding:  
/        /

### 10. Ethical issues

Describe the main ethical issues and how you propose to address them:

The ethical issues of the present study will be addressed in accordance to the Code of Practice on Investigations Involving Human Beings (Eighth Edition) of the University of Strathclyde, the set of ethical principles of the Academy of Social Sciences (AcSS, 2015) and the Ethical guidelines for Educational Research of the British Educational Research Association (BERA, 8<sup>th</sup> ed, 2018).

#### **Privacy (Confidentiality and Anonymity):**

Researcher will maintain strict measures of confidentiality and anonymity to protect participants' identifiable information during the interviews and after the completion of the study. Researcher will make sure that all data will be encoded to ensure confidentiality where requested. Participants will only be referenced according to pseudonyms and any personally identifying information will be edited out of research materials prior to be shared with others or reproduced in publications and related outcomes.

Data will be kept in a secured file with a high secured password on the computer hard drive (H) provided by Strathclyde University for each student and will be uploaded on Starthcloud drive. Any printable documents will be stored at one of the safe lockers available at HaSS Graduate School, Lord Hope building. Participants will be able to

contact Professor Ian Rivers, the Chief Investigator, through an agreed means of contact to discuss any concerns arise during or after the interviews.

These procedures comply with the Code of Practice on Investigations Involving Human Beings (Eighth Edition) of the University of Strathclyde, the Data Protection Act 2018 and the General Data Protection Regulations (GDPR), the set of ethical principles of the Academy of Social Sciences (AcSS, 2015) and the Ethical guidelines for Educational Research of the British Educational Research Association (BERA, 8<sup>th</sup> ed, 2018).

Participants can contact the University's Data Protection Officer at [dataprotection@strath.ac.uk](mailto:dataprotection@strath.ac.uk) for any enquiries regarding their data protection.

### **Avoidance of Coercion and Distress**

Researcher takes into consideration the protection of participant's self-determination and avoidance of any coercion, stress, and bias. To achieve this, researcher will provide participants with full information about the study and explain to them the voluntary nature of their participation and their right to refuse participation or to opt out of the study at any time without any reason or penalties. Participants will be not implicitly or explicitly coerced to participate in this research as the researcher does not have any institutional power to force them to participate, threat them of any kind of penalty if they decide to opt out of the study or would provide extreme incentive to influence them to participate.

If evidence emerges that a participant is feeling distressed, the researcher will immediately allow them to withdraw from the study without penalty and researcher will offer support if participants become upset during interview and will arrange for another counsellor to be available if participants feel they need.

To make participants aware of the above-mentioned ethical issue, researcher will provide potential participants with Participants Information Sheet (PIS) and an Informed Consent. These two forms will explain the nature of the study and the role and rights of participants. These forms will be sent to participants by email or by hand.

### **Harm**

This research project is not intended to elicit painful or traumatic memories. There is no predictable disadvantage, or potential harm could arise during the course of this research as it is not experimental. The researcher will make sure that interviews will be conducted in a safe and secure place to avoid any physical harm, or injuries could occur to participants and the researcher too. The researcher will avoid any excessive demands on

participants, such as sensitive or ambiguous questions, to minimise and manage emotional distress or discomfort that may arise during interviews. Participants will be asked to confirm that their line managers are aware that they are taking part in the project.

### **Gender Consideration:**

Participants of the study will be male and female teachers. The researcher will endeavor to take into consideration any potential gender issues that could arise during the interviews. Sensitive structural inequalities associated with race, gender, socioeconomic status and sexual orientation will not be tolerated during all the stages of interviews, ending the research, briefing or reporting research findings and publication.

### **Participants Information Sheet (PIS)**

To make participants aware of the purpose of the study, researcher will provide them with Participant Information Sheet (PIS). PIS will contain information about the aims and objectives of the research, its significance, and the expected findings. It will explain to participants their voluntary role in this study, the potential risks associated with their participation, duration of the interview session, the importance of their participation, the effect of the data produced from their participation on the research scope, the use and treatment of information they will provide during interviews and to whom it will be reported, and the measurements of their privacy & confidentiality protection.

### **Consent:**

At the start of the study, participants will be provided with a letter of Informed Consent. The consent will clearly state that participants were provided with “Participant Information Sheet” (PIS) that explains the nature of the study and their role in it. The consent will confirm that their participation is voluntary, and they have the right to withdraw their consent at any time during the prior agreed times and dates of interviews with no or any reason and without providing an explanation. The consent letter will inform participants that researcher will consider strict measure of confidentiality to protect any data that can identify their personality and it will be securely stored. The consent will inform that participants will only be able to withdraw their data until the beginning of data analysis and personal data at any point.

**11. Objectives of investigation (including the academic rationale and justification for the investigation)** Please use plain English.

### **Aim of Investigation**

Teacher's perception of the rationale of ICT integration in education is an essential factor in changing their mind-set to integrate ICT in their pedagogical practices. de Winter et al (2010) state that "enabling innovation in teaching and learning appears best achieved by supporting individual teachers' innovation in their own classroom" (p.261).

This research aims to investigate how teachers in Egypt and Scotland perceive the opportunities of integrating ICT into their pedagogical practices in classroom and barriers that may hinder this process. It aims to inform teachers about the role ICT can play in altering their current pedagogical practices and their way of forming subject knowledge by adopting non-traditional teaching approaches that can change their role from traditional teacher-centred educator to knowledge facilitators (Underwood, 2014). If convinced, teacher will be able to select, adopt and operate useful ICT tools that contribute positively to classroom daily teaching/learning activities to increase students' self- efficacy, motivate students and increase their engagement into classroom activities, and improve their learning.

### **Rationale**

Various studies recognize teachers as the most significant factor that help to understand the reasons behind the use or neglect of ICT tools in teaching and learning process. These studies further emphasized on teachers' beliefs in perceiving the positive role of ICT in developing their pedagogical knowledge for better teaching practice. (Celik & Yesilyurt, 2013; Wastiau et al, 2013; Ertmer & Ottenbreit-Leftwich, 2010).

The significance of the present study is that it will shed a light on ICT integration as supportive tools for teachers to develop their pedagogical practices for better teaching in order to enable students to be more active players in managing their learning. It will explore, compare and contrast the various factors that affect the efficiency of ICT technologies integration and will investigate the opportunities for successful ICT integration and barriers that may hinders this process.

### **Research Questions:**

The present research will have to answer one core question:

***How have teachers embraced ICT innovation in the classroom?***

In addition, three sub-questions arise to cover various aspects of the research's main topic.

- 1- What are the perceived opportunities for pedagogical practice in classroom?
- 2- What are the perceived difficulties for pedagogical practice in classroom?
- 3- What are the similarities and differences between teachers in Egypt and Scotland regarding their pedagogical practice of using ICT?

## **12. Participants**

Please detail the nature of the participants:

Participants will be male and female mature school teachers who use ICT tools in their pedagogical practices to deliver their subject(s) content.

Summarise the number and age (range) of each group of participants:

Number: Eight to Twelve teachers from each country      Age (range) 20- 65+ years

Please detail any inclusion/exclusion criteria and any further screening procedures to be used:

Inclusion criteria will consider school teachers who have a permanent teaching post within schools with at least two years of post-probation in their teaching profession and embarking upon Career-long professional learning (CLPL) or further study at Strathclyde university in Scotland or Continuous professional development (CPD) in Egypt. Inclusion criteria will consider only those teachers who use school-based technology in their pedagogy practice.

To confirm this, researcher will make it clear in the Participant Information Sheet (PIS) that any participant would agree to participate in the research should be using school-based technology in their pedagogy practice. To satisfy the above criterion, researcher will use a snowball sampling method which will enable the researcher to select potential participants with target characteristics that suit the research topic.

**13. Nature of the participants**

Please note that investigations governed by the Code of Practice that involve any of the types of participants listed in B1(b) must be submitted to the University Ethics Committee (UEC) rather than DEC/SEC for approval.

Do any of the participants fall into a category listed in Section B1(b) (participant considerations) applicable in this investigation?: Yes ☐ No ☒

If yes, please detail which category (and submit this application to the UEC):

**14. Method of recruitment**

Describe the method of recruitment (see section B4 of the Code of Practice), providing information on any payments, expenses or other incentives.

The present research is conducting qualitative in-depth interviews with school teachers in Egypt and Scotland to understand the opportunities and barriers of using ICT in their pedagogical practices. Researcher will use snowball sampling method to recruit participants. Recruitment will be within the researcher's social network and friends' acquaintances at Strathclyde University and back home in Egypt too. In addition, researcher will use an Advert, as an extra aiding tool in Scotland to recruit more participants with target characteristics related to the research subject who "can serve as the seeds of the snowball sample"( Berg,1988; cited in Kirchherr J, Charles K, 2018). To avoid bias that can emerge from the recruiting method, researcher will endeavour to select a large population that are homogeneous.

**15. Participant consent**

Please state the groups from whom consent/assent will be sought (please refer to the Guidance Document). The PIS and Consent Form(s) to be used should be attached to this application form.

In line with the guidelines for educational research by British Educational Research Association (2018), all participants who will agree to be interviewed will be provided with a copy of the Participants information sheet (PIS) to understand the nature of the research and their participation role and raise their concerns to the researcher for clarification either through direct contact or by email or on phone. Each participant agrees to take part, will be asked to sign a paper copy of the consent form.

Participants in Egypt will be provided with a participants Information Sheet (PIS) and Consent form that contains Arabic translation, their native language, either below or next

to the English version of the consent. Translation will be carried out by the researcher as Arabic is his native language. However, member-checking of the translation will be carried out through an Arabic speaking person who will be selected by the chief investigator to confirm translation consensus.

Participants Information Sheet and the Consent forms are attached to this application.

## **16. Methodology**

Investigations governed by the Code of Practice which involve any of the types of projects listed in B1(a) must be submitted to the University Ethics Committee rather than DEC/SEC for approval.

Are any of the categories mentioned in the Code of Practice Section B1(a) (project considerations) applicable in this investigation? ☐ Yes ☒ No

If 'yes' please detail:

The study employs a comparative research methodology to compare and contrast teachers' perspectives on what good pedagogical practices include and how and why they use ICT in their pedagogical practices in both Egypt and Scotland. A constructivist epistemological framework based on Crotty's model (2003) is applied to explicitly clarify questions about the prevalence, disseminations, and grounds of cultural distinction between Egypt and Scotland as study contexts.

### **Data collection and analysis tools:**

Open-ended semi-structured interviews is the data collection tool for the present study. Interview questions, Consent form and Participation Information Sheet (PIS) will be translated to Arabic language for participants in Egypt. Translation will be carried out by the researcher as Arabic is his native language. However, member-checking of the translation will be carried out through an Arabic speaking person who will be selected by the chief investigator to confirm translation consensus.

Data will be quantified through inductive coding scheme to interpret, classify, categorize, identify concepts, and finding relations between the key themes that emerges from participants' answers to interview questions.

To analyse data, researcher will make use of grounded theory (GT) approach to interpret participants' answers to interview questions in order to understand their perceptions of the study topic. GT approach will help researcher conducting systematic comparisons



between teachers' perceptions of ICT use in their pedagogical practices in Egypt and Scotland as two distinct different cultures.

The use of GT approach in this research does not aim to produce a final theory, rather it aims to achieving conceptual clarity of motivations and obstacles of ICT integration in pedagogical practice from teachers' perspective.

**Participants:**

Participants will be school teachers who have a permanent teaching post within schools with at least two years of post-probation in their teaching profession.

What specific techniques will be employed and what exactly is asked of the participants? Please identify any non-validated scale or measure and include any scale and measures charts as an Appendix to this application. Please include questionnaires, interview schedules or any other non-standardised method of data collection as appendices to this application.

The researcher will use semi- structured interviews with open-ended questions to collect the data. Each participant will be asked to sit with the researcher for approximate 45 to 60 minutes to be interviewed about their perception of the use of ICT in their pedagogical practices at classroom.

Once interviews finished, participants will be asked to review their interview transcripts for verification and correction, if any, prior to starting data analysis process.

Where an independent reviewer is not used, then the UEC, DEC or SEC reserves the right to scrutinise the methodology. Has this methodology been subject to independent scrutiny? Yes ☐ No ☐  
If yes, please provide the name and contact details of the independent reviewer:

**17. Previous experience of the investigator(s) with the procedures involved.**

Experience should demonstrate an ability to carry out the proposed research in accordance with the written methodology.

**Chief Investigator: Ian Rivers**

Ian Rivers is currently a Professor of Education for Social Change. He has held various posts at the University of Strathclyde including Senior Vice-Dean for the Faculty of Humanities and Social Sciences and also Head of the School of Education. He currently

serves as Chair of the Scottish Council of Deans of Education (2018-2020). He is a developmental psychologist specialising in the study of bullying behaviour and its psychological impact. He is also a member of UKRI: Economic and Social Research Council's (ESRC) Strategic Advisory Network (2019-2022) and has served on the ESRC's Grant Assessment Panel A for four years (2015-2019).

### **Other Investigators:**

#### **Ann Beck**

Her background is in social psychology, and she completed her undergraduate and MRes at the University of Strathclyde. She completed her PhD in education policy at the University of Glasgow. Her PhD traced the development and implementation of 'Teaching Scotland's Future' and explored the way in which key organisations can influence policy agendas. An additional focus of this research was the role of individual teachers in the formation and enactment of policy.

Her research explores the processes by which educational policy comes to be and the role of local, global and institutional actors in policy translation. She takes a Critical Policy Analysis approach and draws on Actor-Network Theory (ANT) and democratic theories of network governance. She is particularly interested in the role of global actors in the formation of wider public policy agendas in Scotland.

#### **Stavros Nikou**

Stavros Nikou is a Lecturer in Digital Education in the School of Education, University of Strathclyde. He holds a Ph.D. in Information Systems focusing on Learning Technologies from the University of Macedonia - Greece, a M.Sc. in Computer Science from the University of Houston - USA and a B.Sc. in Physics from the Aristotle University of Thessaloniki. He is also a collaborating research member at the SMILE (Smart Mobile and Interactive Learning Environments) Laboratory.

#### **Mohamed Ibrahim**

I had a BA in English Language & Literature in 1994 from Zagazig University. Since graduation, I have been working in various institutes as an EFL teacher. I was able to deliver various English courses for adults. My passion about using ICT in delivering subject content enabled me to excel in my teaching career and by 2014, I joined the MA TESOL program of Sunderland University to get my MA in TESOL in 2016.

During the study period I was able to write various minor researches about language motivations and barriers, teaching practices and techniques, the effect of second language on mother language. In addition to that, my dissertation, as a major research, was about the significance of integrating educational technology tools into English language classroom.

#### **18. Data collection, storage and security**

How and where are data handled? Please specify whether it will be fully anonymous (i.e. the identity unknown even to the researchers) or pseudo-anonymised (i.e. the raw data is anonymised and given a code name, with the key for code names being stored in a separate location from the raw data) - if neither please justify.

The data will be pseudo anonymous because the researchers know the identities of the participants while the raw data will be anonymised and given code name and the key for code names will be kept on H drive at the researcher designated Desk top computer and uploaded regularly on Strathcloud digital hub while the paper copies of the key will be kept in a secure locker at HaSS graduate schools.

Explain how and where it will be stored, who has access to it, how long it will be stored and whether it will be securely destroyed after use:

The recorded audio data of the participants answers to interview questions will be uploaded on Strathcloud as a secure digital hub. Transcripts of the recorded audio data will be kept in a secure locker at HaSS graduate school. Access to both audio recorded data and transcripts will be granted to the Chief Investigator and the other investigators including the researcher exclusively. Audio recorded data will be stored for five years on Strathcloud while the transcripts will be shredded in coordination with the university data protection officer after the completion and submission of the Dissertation.

Will anyone other than the named investigators have access to the data? Yes ☐ No ☒  
If 'yes' please explain:

#### **19. Potential risks or hazards**

Briefly describe the potential Occupational Health and Safety (OHS) hazards and risks associated with the investigation:

Please attach a completed eRisk Assessment for the research. Further Guidance on Risk Assessment and Form can be obtained on [Occupational Health, Safety and Wellbeing's webpages](#)

#### **20. What method will you use to communicate the outcomes and any additional relevant details of the study to the participants?**

If any of the participants requires a copy of the research outcomes, researcher will provide them with a brief copy of the research by email or post or can meet them to handle it personally.

**21. How will the outcomes of the study be disseminated (e.g. will you seek to publish the results and, if relevant, how will you protect the identities of your participants in said dissemination)?**

Data will be published in the PhD dissertation. Researcher may publish the study outcomes in related scientific journals. Publication will depend on major parts of the dissertation that would follow the strict secure procedures taken in data collection and coding to avoid any disclosure of participants' identities.

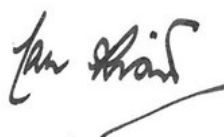
Checklist	Enclosed	N/A
Participant Information Sheet(s)	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Consent Form(s)	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Sample questionnaire(s)	<input type="checkbox"/>	<input type="checkbox"/>
Sample interview format(s)	<input checked="" type="checkbox"/>	<input type="checkbox"/>
Sample advertisement(s)	<input type="checkbox"/>	<input type="checkbox"/>
OHS Risk Assessment (S20)	<input checked="" type="checkbox"/>	
Any other documents (please specify below)	<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>
	<input type="checkbox"/>	<input type="checkbox"/>

## 22. Chief Investigator and Head of Department Declaration

Please note that unsigned applications will not be accepted and both signatures are required

I have read the University's Code of Practice on Investigations involving Human Beings and have completed this application accordingly. By signing below, I acknowledge that I am aware of and accept my responsibilities as Chief Investigator under Clauses 3.11 – 3.13 of the [Research Governance Framework](#) and that this investigation cannot proceed before all approvals required have been obtained.

Signature of Chief Investigator

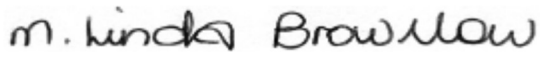


Please also type name here:

Professor Ian Rivers

I confirm I have read this application, I am happy that the study is consistent with departmental strategy, that the staff and/or students involved have the appropriate expertise to undertake the study and that adequate arrangements are in place to supervise any students that might be acting as investigators, that the study has access to the resources needed to conduct the proposed research successfully, and that there are no other departmental-specific issues relating to the study of which I am aware.

Signature of Head of Department



Please also type name here

Linda Brownlow

Date:

11/02/2020 / /

## 23. Only for University sponsored projects under the remit of the DEC/SEC, with no external funding and no NHS involvement

### Head of Department statement on Sponsorship

This application requires the University to sponsor the investigation. This is done by the Head of Department for all DEC applications with exception of those that are externally funded and those which are connected to the NHS (those exceptions should be submitted to R&KES). I am aware of the implications of University sponsorship of the investigation and have assessed this investigation with respect to sponsorship and management risk. As this particular investigation is within the remit of the DEC and has no external funding and no

NHS involvement, I agree on behalf of the University that the University is the appropriate sponsor of the investigation and there are no management risks posed by the investigation.

If not applicable, tick here ☐

Signature of Head of Department

Please also type name here

Date:

/ /

For applications to the University Ethics Committee, the completed form should be sent to [ethics@strath.ac.uk](mailto:ethics@strath.ac.uk) with the relevant electronic signatures.