Teachers’ beliefs and practices of ICT use in Secondary schools in Addis Ababa, Ethiopia.

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Abstract

Ethiopian government policy is committed to integrating Information and Communication Technology (ICT) into education to improve educational quality and equity. As teachers are the fundamental element for the success of this objective, the government has included an ICT module within teacher training to realise ICT practices inside the classroom. However, the actual ICT implementation in education lags behind government expectations.

This research investigates how Ethiopian secondary school teachers' beliefs and practices in Addis Ababa about the use of ICT are constructed. With a symmetrical perspective of Sociomateriality and Actor-Network Theory, the research explores the human and nonhuman factors which facilitate or inhibit teachers' ICT implementation from teacher training to secondary school classrooms. It also investigates teachers' beliefs that shape individuals' perspectives and attitudes to ICT. The analysis of Technological Pedagogical and Content Knowledge is employed to ascertain other potential factors that affect teachers' ICT practices such as the pedagogical design of using technology and contextual characteristics.

The findings show that secondary school teachers possess positive general and pedagogical beliefs with regards to ICT implementation. However, those beliefs face strong barriers when it comes to their translation into pedagogical practices inside of the classroom. In teacher training institutes, trainees are not satisfied with their instructors' pedagogical practices. Trainees argue that the assessment and practicum as a part of teacher training are not designed to encourage ICT practices. In relation to ICT materials, trainees are held back by the institutes in terms of their ICT material access.

In secondary schools in the Addis Ababa area, although ICT implementation is compulsory, the level of ICT practices is very limited. There are multiple reasons for this. Some teachers perceive that ICT itself infringes on teachers' autonomy of pedagogical design – despite them stating that they are in favour of using ICT. Others lack confidence with the use of ICT and are afraid of making mistakes in front of the students. When it comes to ICT materials, frequent system failure makes teachers lose their motivation to use ICT in the classroom. In addition, ICT is found to be associated with being intellectual and upper class.

This research also investigates the perspectives of the development stakeholders involved in Ethiopia's ICT and education. They identify three fields that affect low level of ICT practices in the country: 1) teacher training; 2) teachers' beliefs; 3) materiality, fields which align with the focus of my research. In addition to those commonalities, this

research also documents the heterogeneity in stakeholders' objectives and the inequitable character of the school selection process for the distribution of materials - which could jeopardise the ICT implementation at national level.

This is the first study that examines and represents the voice of Ethiopian teachers in their adoption and use of ICT in teaching. This thesis contributes to synthesise theories and concepts on the adoption and use of ICT in teaching. In particular, it draws attention to the role of materiality, and how it affects teachers' ICT beliefs and practices. Therefore, this study serves as a reference or a first step that will hopefully encourage similar research in other Ethiopian contexts or similar countries, where ICT adoption is promoted within education policy but faces crucial challenges.

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Abbreviations

AU	African Union
AAU	Addis Ababa University
AACG	Addis Ababa City Government
AAEB	Addis Ababa Education Bureau
ANT	Actor-Network Theory
CEBS	College of Education and Behavioural Studies
CEICT	Centre for Educational ICT
CPD	Continuous Professional Development
CTE	Colleges of Teacher Education
DFID	Department for International Development
DP	Development Partner
EDRI	Ethiopian Development Research Institute
EPRDF	Ethiopian People's Revolutionary Democratic Front
ESDP	Education Sector Development Programme
EICTDA	Ethiopian ICT Development Authority
FDRE	Federal Democratic Republic of Ethiopia
FDRGOE	Federal Democratic Republic Government of Ethiopia
FNG	Federal Negarit Gazeta
GER	General Enrolment Rate
GEQIP	General Education Quality Improvement Programme
GIS	Geographical Information Systems
GTP	Growth and Transformation Plan
HDI	Human Development Index
ICT	Information and Communication Technology
IDI	ICT Development Index
IER	Institute of Educational Research
IMF	International Monetary Fund
InsT	Instructional Technology
ITU	International Telecommunication Union
KMU	Kotebe Metropolitan University
KERIS	Korea Education & Research Information Service
KOICA	Korea International Cooperation Agency
MCIT	Ministry of Communication and Information Technology
MFED	Ministry of Finance and Economic Development

MOE	Ministry of Education
NER	Net Enrolment Rate
NIPA	National IT Industry Promotion Agency
NLA	National Learning Assessment
NPC	National Planning Commission
NRI	Networked Readiness Index
ODA	Official Development Assistance
OECD	Organisation for Economic Cooperation and Development
SDPRP	Sustainable Development and Poverty Reduction Programme
SPI	Social Progress Index
PASDEP	Plan for Accelerated and Sustainable Development to End Poverty
PDA	Personal Digital Assistant
PGDT	Postgraduate Diploma in Teaching
PSA	Public Service Announcement
PTI	Plasma TV instruction
QESSP	Quality Education Strategic Support Programme
TESO	Teacher Education System Overhaul
TPACK	Technological Pedagogical Content Knowledge
TVET	Technical and Vocational Education and Training
USAID	US Agency for International development
UNECA	United Nations Economic Commission for Africa
UNESCO-IICBA	United Nations Educational, Scientific and Cultural Organisation International Institute for Capacity Building in Africa
VPN	Visual Private Network
WB	World Bank
ZTE	Zhong Xing Telecommunication Equipment

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Especially, you, who read this, play a part in developing me into better researcher and person I am today.

Last but not least, my number-one motivation, family. I will never forget your endless love and support.

CHAPTER 1: Introduction

1.1. Background to the study

Information and Communication Technology (henceforth ICT) has been argued to act as a stimulus for transformation in political, economic, social, and cultural aspects of our lives – enhancing efficiency and enabling achievements not possible before its appearance and continuous advancement (Castells, 1996; OECD, 2004; Mikre, 2011; Olelewe and Amaka, 2011). The Organisation for Economic Cooperation and Development (henceforth OECD) claims that ICT is able to contribute strongly to economic growth, and that it influences developing countries by enhancing three different ICT integration-led development processes, namely: the improvement of living standards, the effectiveness of production and delivery of public services, and the participation of otherwise unheard people (OECD, 2005). ICT, it is argued, contributes to 'pro-poor growth' (intended as growth which leads to poverty reduction and includes the poor in economic and social activities) and gives the poor an opportunity to have more equal access to resources, information and public services (World Bank, 2003; OECD, 2005). This is possible because people can be more productive and competitive in their profession when they acquire ICT skills proficiency (Yusuf, 2005; Kozma, 2008). To encourage more ICT engagement, countries around the world incentivise the development, deployment and exploitation of ICT in their societies (Buabeng-Andoh and Issifu, 2015). Regardless of varying limitations and opportunities in differing conditions, integrating ICT into the education system has attracted considerable global attention (Wiseman et al., 2018). It is important to prepare students in a way that they acquire familiarity with and competence for ICT utilisation before starting in professions which have been dramatically changed by ICT (Venezky, 2001).

In the case of Ethiopia, the importance and potential of ICT have been highlighted as a key enabler for national development and linked with educational development (MFED, 2010). The first national ICT policy was initiated in 2002. The following passage well summarises how and why the Ethiopian government brought ICT into policy. The vision of this policy was:

> …to improve the social and economic well-being of the people of Ethiopia through the exploitation of the opportunities created by information and communication technologies, for visiting and ensuring the establishment of a sustainable democratic system

and good governance, and for achieving sustainable, rapid socio-economic development (Chekol, 2009:123).

The essential points of this policy regarded infrastructure, telecommunication and education within the Sustainable Development and Poverty Reduction Programme (henceforth SDPRP) 2002/03-2004/05 (MFED, 2002). Moreover, the national development plan known as Plan for Accelerated and Sustainable Development to End Poverty (henceforth PASDEP) 2004/05-2009/10 allocated a separate section for ICT, which outlined objectives with regard to ICT implementation. For instance, the government continuously expanded the field of ICT penetration into human resource development, economy and administration system, education, telecommunication, research and development, and legal framework (MFED, 2006). Subsequently, the Growth and Transformation Plan (henceforth GTP) took over PASDEP's ICT expansion in two different phases. The ICT infrastructure was planned to solidify in phase I (2010/11-2014/15), and phase II (2015/16-2019/20) assigns a separate section for ICT such as e-government, e-commerce, e-learning, and mobile banking (MFED, 2010; NPC, 2016). Once again, this national policy's attention to ICT represented how much the government holds strong beliefs that ICT will facilitate development.

These national plans would be parallel to educational policies, which also stress the potential of ICT in teaching and learning processes. The major objective of ICT integration into education in Ethiopia is quality improvement, because their education is challenged by low-qualified teachers and a lack of teaching materials (MOE, 2010; Latchanna and Basha, 2012). However, in reality, the Ethiopian government focuses on the provision of up-to-date ICT devices, which does not tackle the current on-going challenges, to catch up with the world standard of ICT-integrated education. The next section will briefly introduce the background of Ethiopian ICT and education.

1.2. Background to Ethiopian ICT and education

Ethiopia started ICT-integrated education in the 1950s with the help of the US Agency for International Development (USAID) (Wolde, 2005). When it comes to the format of ICT, it started with a simple radio and evolved to reach its current forms which include Plasma TV instruction and computer labs. Radio is still used, mainly in primary education, and more advanced ICT forms are available in secondary and higher education.

As the Ministry of Education (henceforth MOE) (2010) clearly stated, the major objective of ICT integration into education is quality improvement. The government emphasises that ICT could tackle the challenge of providing high quality education, due to insufficient teacher training and teaching materials (Mekonnen, 2008). These challenges are primarily experienced in remote areas, which lack basic infrastructures including electricity and roads. Most teachers do not want to work under these circumstances, because both teaching and daily life are uncomfortable in such isolated areas. As a consequence, often these teacher gaps end up being filled via dispatching inexperienced or newly qualified teachers – to ensure that students in the area may access education.

As a result, the government prioritised the standardisation of education with teacher training curriculum revision, and in 2003 initiated Teacher Education System Overhaul (henceforth TESO) – which heavily focused on improving educational quality (Kassanhun, 2006). Above all, TESO introduced ICT as a single course. This represented a major difference compared to the previous curriculum. By providing a separate ICT course, (prospective) teachers could understand how ICT can be supportive to their teaching practices (ibid). Since TESO was introduced, the government has kept developing national education policies (discussed further in chapter 2) to familiarise teachers with ICT and enhance their ICT proficiency. This is because it was clear that without formal teaching on the subject, teachers would not achieve learning objectives despite practicing ICT (Bhatta, 2008; Ahmad, 2013). In 2004, Ethiopia launched representative ICT-integrated teaching, namely Plasma TV instruction (henceforth PTI), to deliver education contents across the country (Abera, 2013). To embark on PTI, the government asked for financial support from donor countries and international organisations, but this request was declined because donors did not see enough ICT managing capability in Ethiopia (Assefa, 2017). Nonetheless, the government continued PTI supporting it via its own budget, with the ambition of following objectives which were similar to those of TESO.

With regards to the objectives of PTI, firstly, the Ethiopian government hoped to overcome the shortage of qualified teachers – particularly in remote areas (Bitew, 2008; Latchanna and Basha, 2012). Secondly, the government believed that PTI could be a supportive teaching method that surmounts insufficient teaching materials (Hussein, 2006; Latchanna and Basha, 2012). Lastly, the government attempted to train secondary school students with the new ICT (PTI) so that students could receive standardised education and internationally comparable learning competency – increasingly important in the knowledge economy (Assefa, 2017). As ICT developed, the government attempted to achieve the same PTI objectives but with newer formats of ICT, namely computer labs (80 computers), over a sample of 300 secondary schools (World Bank, 2013). Further details of educational policies and implementation in relation to ICT integration will be discussed in chapter 2.

1.3. Purpose of study

As the government has stressed, the relationship between teachers and ICT is a critical element that could significantly improve Ethiopian education quality. The purpose of this thesis is to understand how Ethiopian teachers' beliefs and practices about the use of ICT in their teaching practices are constructed. As mentioned in the section 1.2, ICT-integrated teaching will not be able to take place without teachers, who are a fundamental element of ICT practices (Schlager and Fusco, 2003; Lawless and Pellegrino, 2007; Almerich, et al., 2016). Hence, this study will investigate the factors which facilitate or inhibit teachers' ICT implementation, starting with teacher professional development. In addition, the scope of the study extends to secondary school classrooms, where both teacher trainees and teachers (will) practise ICT for teaching. The trajectory from teacher training to secondary school will elicit the effects of enabling and inhibiting factors on teachers' ICT utilisation. These factors could become teachers' rationale for (not) using ICT in the classroom.

However, this study will not only focus on teachers, but also pay attention to ICT (and related) materials which contribute to the construction of teachers' beliefs and practices about ICT implementation. To explore the contribution of ICT materials, this study will take a symmetrical perspective of Sociomaterial and Actor-Network Theory, which can help to understand the relationship between teacher and material. The theoretical application magnifies the veiled role of materiality and seeks to analyse how the given materiality within teaching and learning environment (teacher training colleges, private training centres, and secondary schools) influences teachers' beliefs and practices. However, as the field of ICT requires a big financial budget, there is a heavy engagement with stakeholders, who in turn influence policy initiation and implementation. In order to enrich the perspectives from teacher trainers and trainees, this study also investigates the reflections from stakeholders about the current stage of Ethiopian ICT and education. The stakeholders included in the research are: the Ethiopian government; international organisations; donor countries and Chinese companies – which are primarily involved in policy initiation or implementation/procurement. Fullan (2015) caterorises aforementioned stakeholders as external factors that influence 'system-wide' reform in the implementation process (p.76). In this research, taking their reflections into account is important because they interpret why the Implementation is failed in reality.

1.4. Motivation and a brief description of fieldwork

As mentioned earlier, both national and international government concentrate on a bright aspect of ICT as a panacea. However, a number of scholars see ICT as a tool which leads to different dynamics depending on different contexts (Forcheri and Molfino, 2000; Selinger, 2009; Aleksic-Maslac and Magzan, 2012). Thus, ICT needs to be understood and used differently, so as to find the appropriate way for better outcomes in both policy implementation and the teaching and learning processes. Above all, considering the uniqueness of contexts is important including political, economic, social, and cultural characteristics. This is because there is often a simple consideration of ICT as a device itself so that result in negative consequences with regard to pedagogy and learning outcomes (Leonel et al., 2005; Hollow, 2010). Thus, the implementation of new technology in education needs to revise the whole ecosystem of education in order to catalyse the potential of ICT in education (Kellner, 2002). This is what Ethiopian government experiences. The government has heavily invested in ICT and education and ambitiously implemented a series of policies. Furthermore, it assigned 26.5% of government expenditure to education over 10 years which is 9.5% and 12.3% higher than sub-Saharan Africa (17%) and the world (14.2%), respectively (UNESCO, 2020). This active investment is highlighted in ICT and education because Ethiopia's ICT R&D expenditure is ranked 24th out of 121 countries (Dutta and Lanvin, 2019). Nonetheless, the government could not led to remarkable success in spite of all its effort over the last two decades. To understand this gap between government aspiration and unexpected outcomes, I investigated teachers' beliefs and practices as a fundamental element of policy implementation from teacher training to secondary schools.

For data collection, I spent 11 months in Addis Ababa, Ethiopia. It divided into three different trips: 1) nine consecutive months from November 2016 to August 2017; 2) one month December 2017; 3) one month June 2018. The first part of fieldwork was held during the state of emergency which caused a number of disruptions in relation to research activities. Above all, this political unrest allowed me to stay only in Addis Ababa because the Ethiopian government advised every foreigner to stay inside Addis Ababa. Moreover, political instability exacerbated the Internet connection even in the capital. When it combined with unreliable ICT infrastructure including electricity, conducting research was getting more challenging. Due to these two reasons, Addis Ababa was the safest and relatively ICT-reliable city to conduct my research. The second and the third fieldwork were primarily for extra data collection which I could not complete during the initial trip. Having research permission and accessing the right person at the right time would make myself to travel two more times. However, these were crucial visits because I was able to interview important stakeholders which will be discussed in Chapter 5 and 7.

1.5. Research questions

The main research question will be:

How are Ethiopian secondary school teachers' beliefs and practices about the use of ICT constructed?

The sub-questions will be:

1. What factors prevent or enable teachers' ICT competencies in teacher professional development?
2. To what extent does materiality influence teachers' beliefs and practices?
3. How do different stakeholders interpret the cause of ICT implementation failure in education?

1.6. Contribution to knowledge

This thesis aims to provide a threefold contribution to the existing knowledge about ICT and education in Ethiopia. The first one is a theoretical contribution that synthesises a number of theories and concepts. The study will argue that an application of the Sociomaterial and Actor-Network Theory (henceforth ANT) approaches can help to identify the missing links between teachers and their ICT practices – network failure will emerge as a key issue. In the context of Ethiopia, most ICT-related educational research has focused on presenting the challenges that the country and/or its educational system have faced. These studies all point out similar difficulties, such as the shortage of ICT materials and the poor standard of teacher training. However, their findings are not embedded into a theoretical framework which fits the Ethiopian reality. Under this circumstance, the network failure between teachers and ICT remains the same even if they have found repeated patterns. This view is stressed by Wolde (2005:97), who emphasises the desirability of having suitable conceptual and theoretical frameworks for Ethiopia, which help to "integrate ICTs in the classroom and to develop teachers' capacity in ICT". Although Sociomaterial and ANT perspectives provide theoretical rigour, their symmetrical approach toward the human and the non-human seems to be missing a primary difference between the human and the non-human. That is the intimacy of what ICT means to the human. In other words, these theoretical approaches do not sufficiently give the attention to the way humans consider and value the non-human when they decide to engage and interact with it. The thesis will therefore include a focus on the beliefs and values of teachers towards ICT – because these are decisive factors for whether and how teachers implement ICT for their pedagogical usage. In a similar vein, this study applies Technological Pedagogical Content Knowledge (henceforth TPACK) that interweaves teachers' knowledges of pedagogy, content, and technology (Mishra and Koehler, 2006). TPACK argues that only an assemblage of three knowledges could result in efficient ICT implementation inside of the classroom. In this study, the TPACK will be reinterpreted in a Sociomaterial perspective, so that it designates pedagogical knowledge as a social aspect and both technological and content knowledges as material aspects. Thus, these three conceptual and theoretical 'assemblages' would give a novel contribution to understanding how to encourage teachers to practise ICT-integrated teaching.

Second, the methodological contribution is critical because it decides the assemblage of theories and concepts and sequences those applications to the Ethiopian context.The circumstance in Ethiopia was challenging not only because of ICT material shortage but also because of the state of emergency. There were frequent power cuts and not enough ICT materials in the classroom. Somewhat ironically, while the government promotes ICT implementation in every aspect of society, at the same time it monitors, and even suppresses, Internet usage. This methodology of research can serve as a reference that suggests a first step to conducting similar research in other Ethiopian areas, and similar contexts where ICT adoption is promoted within education policy but the ICT overall environment is particularly challenging.

Third, this study provides a novel empirical contribution: to date no other study has investigated and magnified ordinary Ethiopian secondary school teachers' beliefs and practices on the use of ICT. Kirkwood and Price (2013) argue that most research related to ICT and education focus on the early adopters' group, making it difficult to provide accounts regarding general secondary school teachers. On the contrary, this thesis expands the research target to ordinary teachers, contributing to our understanding of the relationship between their beliefs and practices of ICT. Furthermore, to achieve a successful ICT implementation, Abera (2013) argues that the promotion of teachers' ICT awareness needs to be prioritised. Moreover, he emphasises the need to strengthen ICT awareness in the near future. In light of this, this research contributes to filling the research gap pointed out by Abera. In addition to this reflection, this thesis investigates how stakeholders interpret the current status of ICT and education in Ethiopia. There is no study that synthesises the perspectives on this of a range of stakeholders, and that scrutinises missing links within the network of ICT and education.

1.7. Organisation of the thesis

This thesis consists of eight chapters, which are organised as follows. *Chapter 1* (the current chapter) provides an introductory background and guideline of the study, including research purpose, research questions and the contribution to the existing knowledge.

Chapter 2 starts by briefly describing Ethiopia as macro-research context. It then zooms in, focussing on Addis Ababa, which is where I carried out my fieldwork and therefore where this research primarily focuses. A relevant part of this chapter is dedicated to the discussion of the development trajectory of Ethiopian ICT and education policies, which have been implemented during the period 2002-2018. This chapter is also meant to illustrate to the reader the main areas that the Ethiopian government would like to address.

Chapter 3 unfolds the theoretical framework that is applied throughout this study. It primarily concentrates on the Sociomaterial approach and on ANT, which take a symmetrical perspective. They emphasise the role of materials (ICT in this research) that affects human (teachers) behaviours. In addition, this chapter supplements these theoretical conceptions with teachers' beliefs and TPACK, which constitute teachers' ICT implementation in teaching practices.

Chapter 4 introduces the methodology of this research. It describes how I embarked on data collection and designed the study, including study setting and sampling technique. Moreover, it explains how I approached Ethiopian institutions in order to have the permissions to conduct the research. This chapter also explains the reason why I choose particular research methods to answer the research questions.

The following three chapters present and analyse my empirical data, and attempt to answer the research questions listed above. In particular, *chapter 5* explores the factors which prevent or enable teachers' ICT competencies in teacher professional development from both universities and private training centres. This chapter outlines two main thematic concepts: 1) pedagogy and 2) materiality, and analyses how these concepts determine instructors' and teacher trainees' ICT practices. This chapter will investigate how trainees think the current instructors' pedagogy and learning environment (materiality) that construct their ICT competencies that influence trainees to utilise ICT in the classroom.

Chapter 6 examines teachers' general and pedagogical beliefs on ICT, and discusses whether these beliefs are reflected into their teaching practices. Although it intends to discover teachers' beliefs, this chapter also investigates how do (ICT) materials in schools shape teachers' beliefs and practices towards ICT. The role of materiality will be unveiled because it possesses not only Ethiopian socio-cultural characteristics but also the objectives of educational policies that affect teachers' beliefs.

Chapter 7 investigates how teachers and ICT are connected or disconnected within the network of Ethiopian ICT and education. This chapter synthesises the network failures based on each stakeholders' own interpretation and examines the cause of this ICT implementation failure in stakeholders' perspectives. It investigates how these incohesive approaches applied by stakeholders increases the complexity between teachers and ICT practices inside of the classroom.

Chapter 8 summarises the findings of this research and how the research questions posed have been answered. In addition, this chapter recapitulates the contribution of this research in relation to the existing knowledge. Lastly, this chapter offers a few practical recommendations that could (re)connect the missing node within the Ethiopian ICT and education network.

1.8. Conclusion

This chapter has provided the research background, an explanation of why this research is important and a summary of what it can contribute to the existing knowledge. As it emphasised, ICT will be a catalyst that enhances the efficiency and quality of virtually every aspect of Ethiopian development (Chekol, 2009; NPC, 2016). In particular, this chapter shows the reasons why this research concentrates on the field of education, which could help to spread the benefits and potentials of ICT even to the most neglected members of society (Assar et al., 2010; Lake, 2019). For these reasons, the Ethiopian government stresses the importance of providing quality education via ICT, and invests considerable resources in the production of qualified teachers by revising the overall teacher training curriculum.

At the same time, this chapter clarifies that the contribution of this research is not confined to the system of teacher training, but it also includes an examination of teachers' beliefs towards ICT that could affect their practices inside the classroom (Ajzen and Madden, 1986; Kim et al., 2013). In addition, ICT materials are also highlighted as being able to influence teachers' behaviour and practices, through the perspectives of Sociomateriality and the ANT – in this way, this symmetrical approach between teachers and ICT offers this study a useful perspective to investigate the network of Ethiopian ICT and education.

CHAPTER 2: Research context

2.1. Introduction

This chapter will describe the research context, and the trajectory of Ethiopian educational policies related to ICT. The Ethiopian government has implemented ICT-integrated teaching since 1950s (Wolde, 2005; MOE, 2008). The first Ethiopian ICT policy was drafted in 2002 and aimed at improving the overall living standard of Ethiopian people via ICT as an enabler of socio-economic development (FDRE, 2002; IMF, 2004; Chekol, 2009).

To extend the benefits of ICT to the population, the Ethiopian government devoted a section of the Ethiopian ICT policy to education. The government gave strong emphasis to the revision of the curriculum for teacher professional development. This was based on their belief that teachers determine the quality of education (Mekonnen, 2008) and is in line with the idea that ICT-integrated teaching requires teachers to receive the appropriate level of training in order to realise the full potential of ICT in the classroom. In addition, the government stressed the importance of a teaching and learning environment that would support teachers' teaching practices, such as the provision of more advanced ICT materials and ICT-friendly spaces. These two areas are what the Ethiopian government thirsts after and what this thesis will explore in chapters 5 and 6. Hence, it is necessary to understand the context and policies which are the barometer of this research.

This chapter will present this background through the following sections. Section 2.2 will provide a brief description of the research setting (Ethiopia and Addis Ababa) to set the basis for a more contextualised comprehension of the policies regarding ICT and education. It will illustrate the overall socio-economic status, ICT-readiness, and education system of Ethiopia (and more specifically of Addis Ababa) that influence the current level of ICT integration within the Ethiopian society. Subsequently, it introduces the privatisation of Ethiopian education because there is a marked difference between public and private schools with regard to ICT readiness and actual implementation. In addition, it notifies the profile of teachers and trainees such as gender and age which could contribute to the degree of ICT practices. Section 2.3 will discuss the development of ICT-related educational policies between 2002 and 2018. There have been several policy updates, so that the chapter will provide an account of how the ICT sector is embedded in each educational policy that was passed over the past two decades. To help with understanding of policy development, section 2.3 introduces the entwinement of politics and education throughout the Ethiopian history. Then, it briefly shows a cornerstone of Ethiopian educational policy implemented in 1994. Section 2.3.3 will discuss teacher training policies and curriculum, given the government's strong belief in a close relationship between appropriate ICT-integrated teaching and teachers' qualification. Sections 2.3.4 and 2.3.5 examine two different sets of educational policies that can illustrate why and how the government has prioritised ICT integration into teaching and learning processes.

2.2. The research setting

2.2.1. Ethiopia

Located in the Horn of Africa, Ethiopia is the second largest country in Africa, with a population of 109 million (World Bank, 2019a), growing about 2.6% annually in the past decade (World Bank, 2019b). According to the International Monetary Fund (2020), the Ethiopian economy was one of the fastest growing in the world between 2008/9 and 2018/9 (see figure 2.1). Although Ethiopia struggles with inequality, economic growth has benefitted not only the rich but also the poor. As a result, the proportion of the population below the national poverty line decreased from 39% in 2005 to 24% in 2016 (World Bank, 2020). However, poverty reduction has stagnated since 2016, and it is likely to be slowing further or even reverse due to COVID-19 (ibid).

When it comes to social development, Ethiopia sits toward the bottom of global rankings despite its improvement in economic development. In the human development index (HDI) table, Ethiopia ranks 173th out of 189 countries (UNDP, 2019). According to the Social Progress Index[1] (SPI) Ethiopia belongs to Tier 5 out of 6 and ranks 134th among 149 countries – an index which exclusively considers social and environmental factors such as personal rights, inclusiveness, environmental quality, shelter and personal safety (SPI, 2019). Examination of these indicators make the SPI a distinctive index because no other index considers those dimensions in such detail. Despite the very poor performance in this index, it is worth mentioning that Ethiopia, together with the Gambia, Nepal and Sierra Leone, is one of the countries having achieved the largest improvements since 2014 (ibid).

[1]It assesses many aspects of social and environmental performance that consists of three pillars: 1) Basic human needs; 2) Foundation of wellbeing; 3) Opportunity (SPI, 2019).

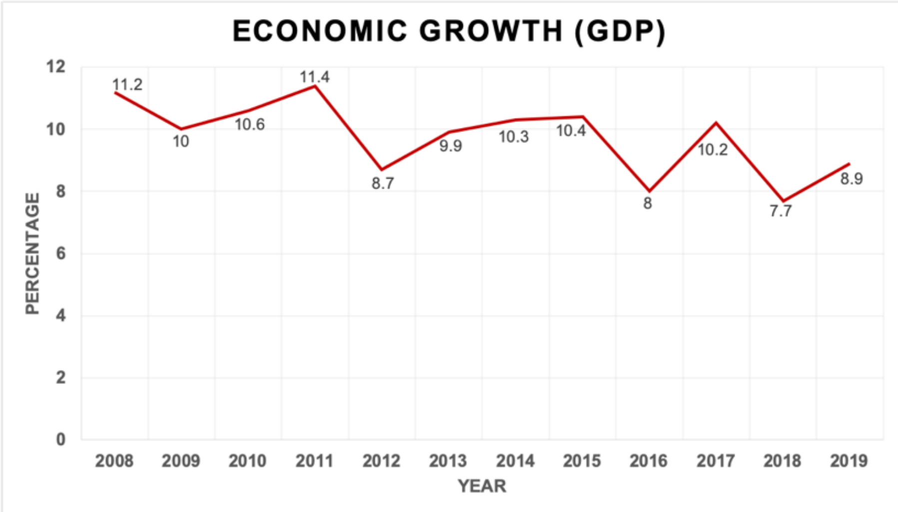


Figure 2.1 Ethiopian GDP growth (drawn by author)

Source: World Economic Outlook Database (IMF, 2020)

The Ethiopian government attaches great importance to education, and allocates to it a much bigger proportion of its expenditures compared to the average of Sub-Saharan Africa as well as of the world (see figure 2.2 below). The government believes that unqualified teachers lead to poor education quality, which has been a major problem in Ethiopia and especially in the remote areas of the country – where further problems relating to the difficulty of accessing education compared to urban areas exist. Hence, to improve quality and equity of education, the government decided to integrate ICT into education to help to overcome geographical disadvantages (as those students would, in principle, receive via technology the same educational contents as those in urban areas). The government selected PTI, which initially used satellite to broadcast educational content across the nation at the same time. Through PTI, Ethiopia aimed to standardise both contents and pedagogy, although this was made difficult by a series of challenges that are discussed in this thesis.

In spite of active investment in ICT, Ethiopia still occupies only the 170th place out of 176 countries on the ICT Development Index (IDI), and the 116th out of 121 countries on the Networked Readiness Index (NRI) (ITU, 2017; Dutta and Lanvin, 2019). Although the components in each index are inevitably concentrating on ICT infrastructure, these two indices are used as a yardstick of ICT readiness, enabling judgements on what to improve. In NRI, the rank of Ethiopia for the specific indicator of governmental ICT investment is much higher than its overall rank of 116th. For instance, for R&D expenditure by the government and higher education, Ethiopia is ranked in 24th out of 121 countries (Dutta and Lanvin, 2019).

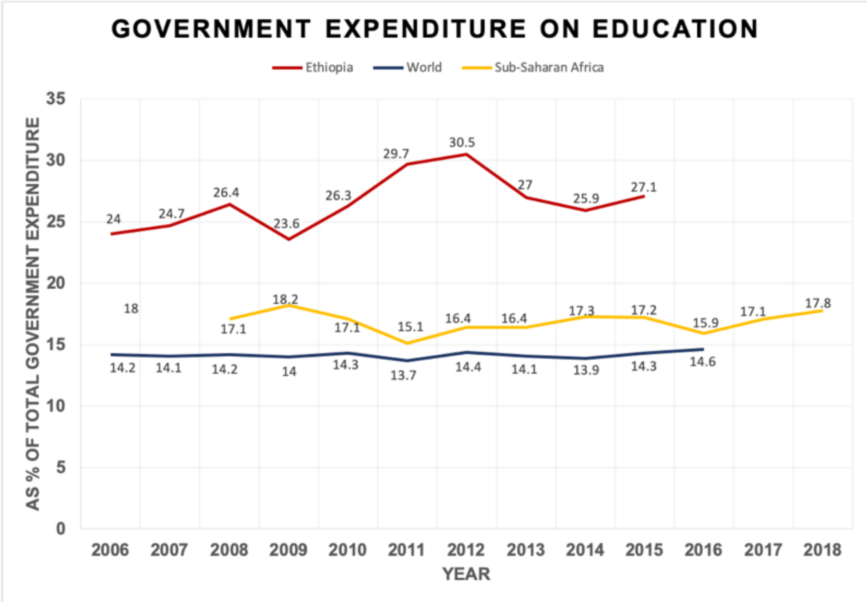


Figure 2.2 Government expenditure on Education (drawn by author)

Source: UNESCO Institute for Statistics (UNESCO, 2020)

2.2.2. Addis Ababa

Addis Ababa is the largest city in Ethiopia, with a population of 4.794 million (CIA, 2020). It is also often described as the capital city of Africa because Addis Ababa hosts various international organisations and embassies, including the African Union (AU) and the United Nations Economic Commission for Africa (UNECA) (UNECA, 2015). The city of Addis Ababa is hierarchically structured into administrative districts. The city consists of 10 sub-cities, which in turn are sub-divided into 110 'Woredas' (Kassahun, 2014). Their close relationships to one another are required to successfully implement policies initiated by the federal government.

Being a capital city has various advantages, including better communication infrastructure and numerous channels which support stakeholders involved in policy implementation. These bring advantages not only to the people who work as government officials, but also to ordinary citizens living in Addis Ababa. For instance, there is an evident gap in the literacy rate between the Addis Ababa population and the national average. The literacy rate of Addis Ababa residents is 86.5%, which is much higher than the average national rate of 51.77% (UNESCO, 2020; World Population Review, 2020).

Educational statistics reveal better access and ICT-related infrastructures in Addis Ababa secondary schools compared to other Ethiopian regions. As this thesis investigates ICT in secondary education, in the following paragraphs, I provide educational statistics regarding these schools: the 228 secondary schools in Addis Ababa (76 government schools and 152 non-government schools), and also more generally the secondary schools from emerging regions[2] in Ethiopia.

Firstly, access to secondary education in Addis Ababa is better than the other regions. For instance, Addis Ababa has always had the highest General Enrolment Rate (GER) and Net Enrolment Rate (NER) (MOE, 2019). For instance, while the national target for Grade 9-10 GER is 62%, for Addis Ababa this is as high as 123.3% – much higher than the national average of 48.5% (MOE, 2019) (see table 2.1). Although there is no national target for Grade 11-12 GER, there is a wide gap between national average (14.8%) and Addis Ababa (54.1%) (see Table2.1). In addition, pupil section ratio[3] in Addis Ababa is the lowest (41.1), whilst the national average is 56.8 and in the Somali region it reaches a value of 112.8 (MOE, 2019) (see figure 2.3). In other words, pupils in Addis Ababa experience less overcrowded classrooms, which arguably provides them with a better chance to access the learning environment and facilities.

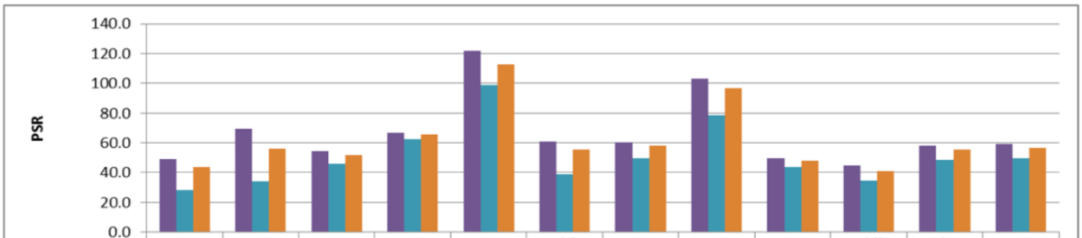
	Grade 9-10			Grade 11-12		
Region	**Male**	**Female**	**Total**	**Male**	**Female**	**Total**
Tigray	71.2	72.1	71.6	15.0	11.6	13.3
Afar	20.4	13.9	17.4	5.5	4.0	4.8
Amhara	57.0	62.0	59.5	20.7	19.1	19.9
Oromia	47.4	36.1	41.8	16.3	12.3	14.3
Somali	27.4	18.3	23.2	12.8	9.2	11.2
Benishangul-Gumz	67.0	50.1	58.7	13.9	11.2	12.6
SNNP	48.0	39.0	43.5	11.0	6.5	8.7
Gambella	106.5	97.0	102.0	42.4	12.4	28.1
Harari	70.2	55.0	62.7	15.2	15.0	15.1
Addis Ababa	116.3	129.8	123.3	51.9	56.1	54.1
Dire Dawa	56.2	50.4	53.3	15.7	13.9	14.8
National	**51.3**	**45.6**	**48.5**	**16.4**	**13.2**	**14.8**

Table 2.1 Secondary GER Split by Cycle, 2011 E.C. (2018/2019)

Source: Education Statistics Annual Abstract (MOE, 2019)

[2]There are four regions, which are officially defined as emerging regions by the government: 1) Gambella; 2) Benishangul; 3) Afar; 4) Somali (Gebre-Egziabhere, 2018). The regions are considered as less developed than the rest of country (UNHCR, 2018).

[3]This ratio shows how many pupils are in the classroom so that it could reflect the level of access to classroom facilities (MOE, 2019).



	Tigray	Afar	Amhara	Oromia	Somali	Benishan gul-Gumz	SNNP	Gambella	Harari	Addis Ababa	Dire Dawa	National
Grade 9-10	48.9	69.2	54.2	66.6	121.9	60.7	60.2	103.2	49.5	45.0	58.2	59.3
Grade 11-12	28.3	34.0	46.0	62.6	99.0	38.9	49.6	78.3	43.8	34.8	48.8	49.7
Grade 9-12	44.0	55.9	51.9	65.6	112.8	55.4	58.2	96.6	48.2	41.1	55.7	56.8

Figure 2.3 Pupil Section Ratios by Region, 2011 E.C. (2018/2019)
Source: Education Statistics Annual Abstract (MOE, 2019)

Addis Ababa also performs well in relation to gender equality compared to other regions. The national target of gender equality in secondary education is represented by the gender parity index[4]. The baseline for the index started from 0.91 in 2013/2014 and the national target is 0.98 in 2018/2019. Addis Ababa, with a figure of 1.10 is one of only two regions (together with Amhara: 1.05) where more girls continue to secondary schools than boys (ibid) – statistics which are striking in a masculine and patriarchal society such as the Ethiopian one (Allo, 2018), and which could be pointing to dynamics where boys are disadvantaged.

Secondly, Addis Ababa secondary schools outperform other regions in terms of ICT-related infrastructure standards. For example, the national average rate of power supply in secondary schools is 74.6%, whilst 98.2% of Addis Ababa secondary schools have stable electricity. In the case of Somali and Gambella schools, only 39.7% and 36.7% have access to electricity, respectively. The importance of access to electricity is evident, if we consider that electricity enables the functionality of Plasma, and that PTI has been one of Ethiopian government's major ICT-integrated educational programmes aiming to increase access and quality of education (Abera, 2013). The national average rate of Plasma functionality is 72.9%, with some regions falling below average despite having enjoyed economic growth – e.g. Benishangul (69.6%) and Gambella (71.9%).

As part of the plan for Plasma implementation, the government has piloted the installation of computer labs with Internet connections (see section 2.3.3.2). There is a gap between Addis and the rest of the country also in terms of computer functionality, with a rate of 77.1% of computers being functional in schools in the capital and only 65.5% in the Benishangul and 36.4% in the Gambella regions (MOE, 2019). In line with computer

[4]This index indicates whether boys and girls equally participate in secondary education. A figure of 1 indicates there is no inequality between boys and girls.

functionality, the Internet connection is also required to achieve the government's ICT-integrated education. In the case of Addis Ababa, 75.9% of secondary schools are Internet-connected. In contrast, the Internet is available in only 21.5% of secondary schools across the country.

Based on these statistics, Addis Ababa would appear to have a strong basis to be able to provide quality and ICT-friendly education inside of the classroom. However, the actual teaching and learning conditions in state schools are not as rosy as the above figures suggest. This is because those figures are averages of both state and private schools, with the latter pushing averages significantly higher. For example, advanced ICT infrastructure, such as computer and Internet connection, are more frequently found and functional in private schools than in public schools. It is interesting to note that ICT infrastructures are better in non-government schools despite PTI is only compulsory and systematically used in government schools.

2.2.3. Privatisation of education

In Ethiopia, only 10.4% of secondary schools nationally are private schools (MOE, 2019). Although this percentage does not seem to be high, it increases to 66.6% when it comes to private schools in Addis Ababa. As mentioned, the reason of having desirable statistics in relation to ICT-related infrastructure is because of private schools. With outstanding tuition fees, private schools can offer advanced ICT environment to their students as well as teachers. However, their ICT infrastructure does not include PTI that is supposed to enhance the quality and interaction during the lesson. Bitew (2008) argued that private schools (Catholic school in his research) focused more time on interactive discussion and communication than public schools with PTI. In other words, private schools and teachers are more supportive to their students even if they do not implement PTI into teaching practices. For instance, during the COVID-19 pandemic, private schools students have not missed much of their learning with the help of ICT (Telegram is widely used in private schools as a platform) (Hailu, 2020). However, this is not possible to observe from the rest 33.3% of public schools in Addis Ababa. Thus, it is important to identify what is actually happening in the public schools that could represent the reality of Ethiopian ICT and education.

2.2.4. Profile of teachers and trainees

As the context affects individuals' beliefs and practices, a basic background of teachers (and trainees) such as gender and age could determine the adoptability of ICT in teaching and learning (Baker, et al., 2007; Davison and Argyriou, 2016; Shaouf and Altaqqi, 2018).

In Ethiopia, a secondary school teacher is male-dominated job because female teachers only accounts for only 24.2% which is a lot lower than the average of Sub-Saharan Africa (31.1%) (World Bank, 2021). This figure even went down to 19.2%[5] in six selected schools (see figure 2.4) where I conducted interviews and classroom observations. At the initial stage of the interview, I asked interviewees to briefly introduce themselves and they normally told me subject, teaching experience, and university where they studied. Although I would like to know more, my colleagues advised me that I had to be cautious about asking teachers' (trainees') ethnicity and religion. Thus, I decided not to ask these private questions to them unless they naturally shared. When it comes to the age of participants, it varied from late 20s to early 60s (see figure 2.4). On the one hand, most of 20s were teacher trainees and they were familiar with the idea of ICT regardless of their urban/rural origins. On the other hand, 50s above participants were not familiar

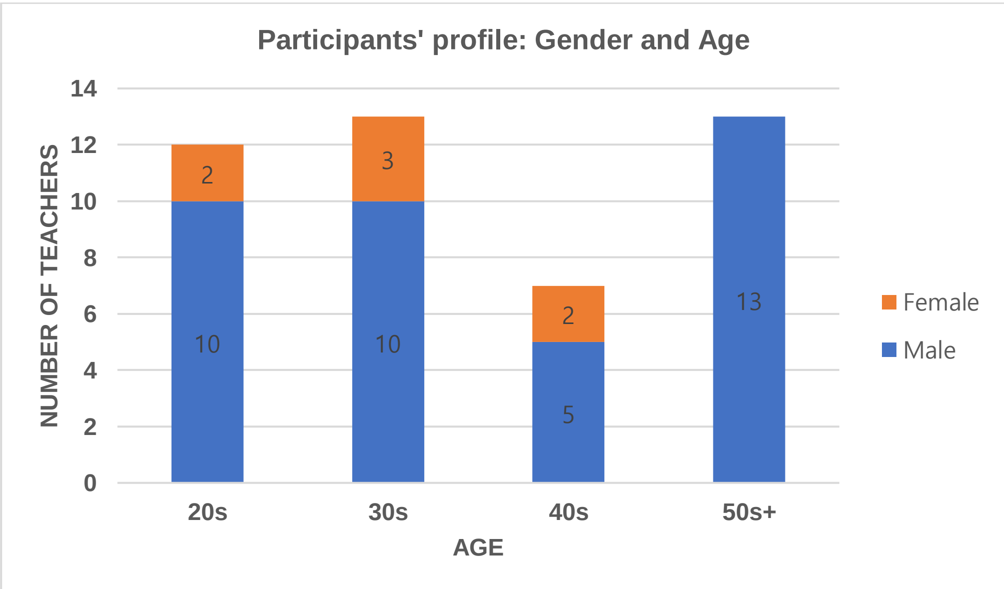


Figure 2.4 Participants' profile (drawn by author)

Source: My primary data answered by teachers and trainees

with ICT itself because they did not receive any ICT-related training when they were trainees. Apart from ICT familiarity, another big difference between young and senior generation of teachers was socio-economic status (salary and social acknowledgement)

[5] This statistic is from my data collected from six selected schools' demography.

which affects their job satisfaction. Abede and Woldehanna (2013) argue that 86.1% of Ethiopian teachers think that their salary is not adequate level compared to their workload and responsibilities. In addition, teachers felt that their commitment, duties, and responsibilities were not appreciated by parents and communities so that they were often discouraged and decided to leave teaching profession (ibid). When these are combined with a poor school support and materiality, teachers could easily be demoralised. More seriously, teachers' (trainees) socio-economic status leads to unexpected challenges in relation to teaching and learning process which will be discussed in the chapter 5 and 6.

2.3. Ethiopian ICT-related educational policies

2.3.1. The entwinement of politics and education

Under the Marxist Derg regime (1974-1991), the ultimate goal of education was to produce people who possessed a solid Marxist Leninism ideology (Mekuria, 2009; Wondemetegegn, 2016). Although the access of education was significantly expanded, during this period, the educational quality was degraded and the curriculum became more politicised (Engel, 2011).

Since the Ethiopian People's Revolutionary Democratic Front (EPRDF) came into power in 1991, a national reform extensively began to build more stable, peaceful, and democratised country (Wondemetegegn, 2016). Under the EPRDF, education was again a key area to transform the whole nation into a new system. This was why the Ethiopian education has been inseparable from politics. This entrenched relationship could be found during my research in two aspects: 1) Plasma TV utilisation inside of the classroom (see chapter 6); 2) pilot school selection process by the government (see chapter 7). Firstly, using Plasma TV has been a top-down policy so that teachers have to use it regardless of poor ICT infrastructure. Under this circumstance, teachers felt pressure because they might be disadvantaged when they did not use ICT. Some schools occasionally monitor how teachers use Plasma TV for their lessons (see section 6.5.1.3). This made one teacher intentionally showed a broken Plasma TV to MOE officials who observed classroom teaching (see section 6.4.1.5). What this teacher would like to prove was his innocence of not using Plasma TV. Secondly, two interviewees argued that the selection process of pilot schools was suspicious because some of schools were not fulfilled the basic criteria of being pilot schools (see chapter 7). In other words, they doubted that some pro-government schools could be benefited by having a close relationship with the government. Although these entwinement of politics and education did not come to the surface, possible signals were found throughout the research.

2.3.2. Major educational changes since 1994

The government started to reshape many aspects of education. The educational reform, launched in 1994 and called *Education and training policy*, was a milestone in Ethiopian education. Its main objective was the ‘cultivation of citizens’, which aimed to encourage citizens to participate more actively in political, economic and social arenas (MOE, 2002a:15). As a result of this educational reform, the nation would accomplish economic and social development (FDRGOE, 1994).

One of the major changes was the reform of the graded school system. In particular, the completion of general secondary education has become grade 10, and grades 11 and 12 have been considered as preparatory years for tertiary education (Mekonnen, 2008). Moreover, the bachelor degree programme was shortened from four to three years (ibid). Although these structural reforms did not directly concern teacher education, this had to be revised as well because the new system and curriculum had to be implemented via teachers.

To accomplish the objectives of the policy, the government states that teachers should have a necessary qualification and certain teaching competencies as preconditions (FDRGOE, 1994). Furthermore, the government recognises that provision of both pre- and in-service training are required to train qualified teachers (ibid). Since the 1994 Education and training policy reform, the Ethiopian government implemented a five-year programme of educational policies called the Education Sector Development Programme (henceforth ESDP) (MOE, 2008). Although the first ESDP (1997/1998 to 2001/2002) did not directly consider ICT-related education, the government established the Ethiopian ICT Development Authority (EICTDA) in 2002 to implement the ICT policy based on two pillars: 1) e-government and 2) ICT in education (Chekol, 2009). In particular, the strategy for implementation of ICT in education and its action plan were categorised into three e-Education initiative strategies (ibid):

- The National SchoolNet Initiative Programme[6]
- The National ICTs in Higher Education Initiative[7]

[6]It aimed to utilise ICT for the teaching and learning process at the level of primary, secondary, technical and vocational schools.
[7]Its goal was the deployment of ICT in tertiary education including universities, colleges and research institutions.

- The National ICT Education, Training and Awareness Initiative[8]

The Ethiopian government gradually integrated ICT into education from primary to tertiary level including vocational training. In addition, regardless of the educational level, teacher education has always been prioritised because it was seen as a necessary element for the policy to be successfully implemented. This is why section 2.3.1 concentrates on revising the two major teacher training policies that played a pivotal role in ICT implementation into teaching practices. Although the government redesigned teacher training curriculum over time, it has been difficult to witness ICT utilisation that meets the government objectives because of the challenges arising in the functioning of teacher training institutes (see chapter 5). Therefore, it is important to comprehend the rationale of policy-making and of the actions taken to improve teacher training curriculum.

2.3.3. Policies of teacher professional development

2.3.3.1. Teacher Education System Overhaul (TESO)

Although there were several challenges with which Ethiopian education struggled, the government identified unqualified teachers as a fundamental factor that hinders educational quality. Hence, in 2003, TESO was introduced to set a new teacher training curriculum to enhance educational quality (Kassanhun, 2006; Mekonnen, 2008). TESO was designed by the Ministry of Education, Addis Ababa Education Bureau, Oromia Education Bureau and Ethiopian Teachers' Association (Mekonnen, 2008). They pointed out a number of problems related to teachers and their training which had to be rectified (MOE, 2003). Firstly, they believed that teachers (including primary, secondary, and tertiary levels) were not competent in either content or pedagogical knowledges, which led to poor educational quality. Secondly, they argued that the training had been theory-based without practicum. Due to this, teachers would struggle with the actual delivery of teaching, which they had not experienced during their training programmes. Thirdly, there had been no emphasis on professionalism and job ethics – which these bodies instead believed to be an important part of the training. As a result of these inadequacies of the teacher training programme, teachers often opted for having a part-time jobs in sectors others than education.

[8]It tried to enhance ICT literacy and proficiency, not only through classroom-based education but also by distance and virtual learning.

To tackle these problems, TESO primarily concentrated on the following two areas. First, TESO prioritised teaching practicum, which allowed teacher trainees to practice their knowledge; while a teaching practice module existed also before TESO, after the reform this was significantly strengthened – increasing from 3 credit hours per week to 25 (Mekonnen, 2008). In other words, teacher trainees were required to complete around 25 hours of practicum after TESO was implemented, therefore gaining far greater actual teaching experience during their training. Second, TESO included a series of new courses, which emblematised a radical shift compared to the previous teacher education. An example of this is the introduction of four major professional courses such as action research, civics and ethics, English communication skills and ICT. Prospective teachers were expected to take 35 credit hours from these courses. As a result, both practicum and professional courses covered a more diversified content, and the engagement with a diversity of topics became essential for teacher trainees to become qualified teachers.

When it came to secondary teacher education, TESO pointed out three specific problems in teaching practices. First of all, a shortage of qualified teachers who could provide adequate quality teaching. Secondly, teachers adhered to conventional ways of teaching even if the government encouraged them to utilise ICT in the classroom. Not only were ICT materials not properly ready to use, but also teachers' beliefs in ICT, which are fundamental for a pedagogical use of ICT, were not ready for the adoption of more modern teaching methodologies. Thirdly, the size of classes was too large. Even in Addis Ababa, where the pupil section ratio was relatively lower than in the other regions, the number of ICT materials was insufficient to allow effective teaching.

Under these circumstances, TESO set out specific objectives for the secondary teacher education programme. First, TESO aimed to produce teachers who were both academically and professionally qualified. Second, teachers were trained to utilise and produce resources and educational media using ICT to support students' learning processes. Third, TESO provided teachers with opportunities to learn and apply managerial and planning skills to make classroom management more effective. These objectives were in line with the readjustment of credit hours for teacher education (see above; 35 credit hours of professional courses). This illustrates the government's view was that the main reason for having ineffective teachers stemmed, not from insufficient content (subject) knowledge, but from poor pedagogical content knowledge. It was understood that it was not possible to produce effective qualified teachers only by equipping teachers with content knowledge; instead, it is crucial to cultivate practical teaching (pedagogical) skills – including educational, psychological, sociological, and technological aspects. This is what led TESO to revise the teacher training curriculum and put a greater weight on professional courses and practicum rather than on subject-specific content knowledge training. For example, under the previous teacher training programme, secondary school teacher trainees undertook around 50 credit hours in their major subjects (i.e. the content they would teach, such as geography, history, etc.). However, this was reduced to 30 credit hours, which were less than professional courses (which were 35).

However, the implementation of TESO was criticised because it took several years to introduce teacher education policy since Education and Training policy (Mekonnen, 2008). This criticism led to a new intervention within teacher education curriculum, the introduction of the Postgraduate Diploma in Teaching (discussed in the next section).

2.3.3.2. Postgraduate Diploma in Teaching (PGDT)

The advent of TESO is considered a radical paradigm shift because it was the first entire overhaul that redesigned teacher professional development since 1994 (Areaya, 2016). Although TESO was meant to bring about significant improvements in teacher training, it soon encountered some concerns in relation to teachers' competence and teaching skills (ibid). The rationale for providing a wide range of professional courses and extra credit hours allocation for practicum was to achieve quality education via qualified teachers. However, after 6 years of TESO, little improvement was observed, not only in teacher training institutes but also in schools. As a result, the Ministry of Education set out to improve the teacher training programme by introducing the Postgraduate Diploma in Teaching (henceforth PGDT), which is still active.

To enrol in PGDT, teacher trainees firstly need to complete a three-year undergraduate degree (considered a content-based training). Then, they could join one year of PGDT to obtain a degree in teaching (considered a pedagogy-based training) (World Bank, 2017). It is a consecutive model of teacher preparation, because teacher trainees first get their qualification in the subjects, which they will teach, and then take a one-year extra course primarily for pedagogical training. In this regard, PGDT offers a more pragmatic and reflective approach than TESO because while TESO simply increased practicum hours, PGDT fully focuses on improving pedagogical skills. The importance attached to PGDT can be seen by the fact that the government reached out to teachers who already completed TESO, demanding that they attended additional PGDT training during the summer holiday. Since it is not possible to complete a one-year PGDT course during a single summer holiday, summer PGDT was delivered throughout three years. The interviewees from Kotebe Metropolitan University, whose views will be discussed in chapter 5, are indeed summer PGDT students.

With regard to ICT, PGDT has an independent module called 'Instructional Technology (henceforth InsT)', which covers how to implement ICT into teaching practices. The module was designed in 2013 by the MOE and is implemented in 10 public universities (Kassa and Amdemeskel, 2013). An Introduction of the module syllabus clearly states its aim as follows:

> '*The module is prepared to equip students with the basic concepts, understanding and principles of the nature and use of media. It is prepared to help you develop your own rationale or justification of efficient selection and utilisation of media for effective educational ends. i.e. effective teaching and learning*' (MOE, 2013:6).

The module also outlines learning outcomes students would gain upon completion of this module. Out of five learning outcomes, the following two summarise well what the Ethiopian government would like to see from the implementation of ICT for education. First, trainees should be able to utilise computer and broadcast media (including Plasma) when they deliver lessons in the classroom. Second, trainees should have the ability to find relevant materials for their lessons through online resources.

In reality, PGDT did not succeed in bringing about major changes. For example, the first PGDT graduates completed their programme in 2011/12 academic year and started their teaching professions; yet, according to the Regional State Education Bureau expert, both the attitudes and the quality of PGDT graduates when teaching in secondary schools were not satisfactory. For instance, secondary schools assessed that there were no discernible differences between TESO graduates and PGDT ones, even after the implementation of the new curriculum (Areaya, 2016). Despite that PGDT teachers were supposed to successfully implement ICT-based teaching practices in the classroom, it was difficult to observe ICT implementation by teachers who had completed PGDT. These shortcomings are repeated because the government treats teacher training as a separate system, in other words the government does not consider the influence of educators' pedagogy, ICT materials, and trainees' beliefs alongside teachers' actual ICT practices. Under this circumstance, ICT-related teaching practices of PGDT graduates were the same as those of TESO graduates because the government did not identify possible (dis)enablers that (de)construct teacher training system. To ascertain the reality of teacher training, chapter 5 will pay attention to entangled factors of both hardware (ICT materials) and software (human-related) in teacher training institutes that affect the capabilities of teacher trainees. Moreover, it will study the differences between private training centres and public universities in terms of hardware and software

2.3.4. Education Sector Development Programme (ESDP)

The Education Sector Development Programme was launched in 1997/1998 to realise the objectives of the 1994 education and training policy. In general, the ESDP aims at improving accessibility, elevating quality, enhancing effectiveness and accomplishing equity of every level of Ethiopian education (Martin, et al. 2000). These general objectives of ESDP (improving access, quality, and equity) are in line with the objectives of ICT integration into teaching. Thus, the examination of ESDP, particularly its ICT-related component, is useful for its ability to shed light on the actual ICT implementation in teacher training institutes and secondary schools (see chapter 5 and 6).

ESDP is a 20-year educational programme led by the Ethiopian government, which is divided into multiple five-year stages. The ESDP I was implemented in 1997/1998 and ended in 2001/2002. ESDP II was launched immediately after ESDP I, from 2002/2003. However, ESDP II only lasted three years because the Ethiopian government initially intended to combine ESDP II with another five-year comprehensive education programme (2000/2001 to 2004/2005) (MOE, 2002b). Thus, the ESDP II concluded in 2004/2005 (ibid).

For both ESDP I and II, the field of ICT and teacher education was not discussed in depth instead the policies shared similar goals to the Education for All and the Millennium Development Goals initiatives (ibid). In other words, the government focused primarily on achieving universal primary education, as well as quality and equity in education, with a lesser focus on ICT integration. More ICT-engaged educational policies (particularly teacher education and ICT material provision) have been discussed since ESDP III.

2.3.4.1. ESDP III

The overall goals of ESDP III, which was implemented between 2005/2006 and 2010/2011, were similar to general objectives of ESDP I and II – e.g. increasing access to educational opportunities, improving the quality of education and addressing equity issues across genders and regions (MOE, 2005). At the same time, ESDP III specifically emphasises the importance of both pre-service and in-service teacher training in order to improve the quality of education (ibid). Although the improvement of educational quality has always been a top priority of ESDP, with ESDP III for the first time ICT was directly brought into policies. In the same vein, the curriculum of teacher training has also been changed since 2009 (almost at the end of ESDP III). For example, it used to be required to obtain only a three-year of bachelor degree but since 2009 teachers must obtain a one-year additional professional teacher training qualification (see the discussion above on PGDT) (MOE, 2010; Getu and Teka, 2018). This emphasis on teacher training is indicative of the fact that the government is eager to improve quality of education primarily via producing qualified teachers.

With respect to ICT, the usage of ICT in secondary school is promoted not only to enhance teachers' pedagogical skills through ICT, but also to enable teachers and students to utilise e-materials (ICT-based) for education (MOE, 2010). The government believes that ICT integration into education will enhance the quality of both teaching and learning because ICT implementation could improve and diversify the pedagogies teachers can build upon (ibid). This is because ICT helps students to understand through visualisation, as well as standardising learning content in an attempt to prevent poor education quality from under-qualified teachers. To achieve this, in ESDP III, the government initially argued for Plasma TV installation in every secondary school classroom (MOE, 2005; Abera, 2013). Plasma TV instruction was launched in 2004 as an innovative teaching method in the Ethiopian context, with the hope it would enhance the quality of secondary education (Abera, 2013). The core idea of Plasma TV instruction was initially the substitution of under-qualified teachers for Plasma teachers. Thus, the government could achieve standardisation of education, regardless of school location (urban or rural). However, as mentioned in section 2.2.2, the present circumstances of Plasma TV installation and functionality are far from being reliable. These issues are expanded upon in chapter 6 which examines teachers' ICT practices inside of the classroom.

Moreover, ESDP III introduced the SchoolNet Programme, which aims to support the Ethiopian education system with ICT (MOE, 2005). The Programme encompasses three main targets: 1) providing personal computers to establish Internet laboratories; 2) organising teacher professional development; 3) digitising the current Plasma TV contents to provide web access (ibid). These seem to be plausible plans for ICT implementation from teacher training to secondary schools. However, progress towards the achievement of the three targets is very slow, with little noticeable improvement. The focus of this thesis is not to compare different policies with one another, but to illustrate teachers' behaviours and beliefs from training through to classroom practices (chapter 5 and 6) – keeping in mind the policies which have been implemented with regard to ICT and education.

In spite of its attempt to improve the previous policies, the success of ESDP III in improving students' learning outcomes was limited (MOE, 2010). This was firstly because ESDP III was still at an early stage of ICT-integrated education, with plenty of room for refinement in terms of how to structure and implement ICT-related policies. Secondly, ICT implementation focused only on secondary and tertiary education, ignoring the potential to progress ICT diffusion from the bottom of educational system, primary education. A decision that Development Partners and those who work as ICT experts disagree with. As many partners are actively involved in this field, their reflections, which interpret the current circumstances of ICT and education, will be introduced in chapter 7.

2.3.4.2. ESDP IV

In comparison to ESDP III, ESDP IV (implemented between 2010/2011 and 2014/2015) contains ICT as a separate component and as one of the five factors, which are seen as crucial for quality of both primary and secondary education. These factors are: 1) development of teachers and leaders; 2) curriculum, textbook and assessment; 3) resource utilisation and management in school; 4) the use of ICT; 5) improvement of school infrastructure (MOE, 2010). Above all, ESDP IV prioritises "Information and Communication Technologies (ICT) and teacher and leader development" to accomplish its two objectives, namely, improving general quality of education, and increasing the access and equity of education (MOE, 2010:14). It forms to two major objectives of the ESDP V; 1) improving the access to quality primary education; 2) sustaining an equitable access to quality secondary education (MOE, 2015). The focus on quality primary education is intended to make Ethiopian children, youth and even adults participate in the national development (ibid). Moreover, it believes that an equitable quality secondary education could be both a basis and a bridge to allow Ethiopia to graduate to a middle income country group, as well as to increase the level of competencies of national human resources (ibid).

The government is aware that providing ICT infrastructure will not be enough to improve the quality of education. Hence, ESDP IV deals with three other aspects to improve the effectiveness of ICT materials provision. First of all, it develops and implements a 'technology responsive ICT national curriculum' from primary to tertiary education, as well as any other educational institutions (MOE, 2010:23). Secondly, ESDP IV focuses on teacher training to raise their ICT awareness. This awareness training is intended not only to equip teachers with basic ICT skills, but also to overcome teachers' fear for ICT (ibid). This is why the government acknowledged that teacher training needs to strongly focus on teachers' confidence with ICT practices and their ICT awareness (ibid). The main recipients of the training will be prospective school principals and teachers. The role and determination of school principals has an influence upon teaching standards and learning environment, both of which are pivotal for students' learning outcomes (Leithwood et al., 1999; Afshari et al., 2008). For instance, when school leaders receive ICT-related training, they tend to encourage ICT integration in every classroom of their schools (Selinger, 2009). To strengthen general teachers' effectiveness, both pre-service and in-service curricula were revised to improve academic capability as well as professional consciousness (MOE, 2010). Chapter 6 will explore Ethiopian teachers' beliefs that are not only from teachers' perspectives but also from students and school vice-principals' ones. Thirdly, ESDP IV aimed to expand access to ICT infrastructure across all secondary schools, in order to increase ICT benefits for teachers and students (MOE, 2010). This included the full installation of Plasma TV education and e-learning programme with computer laboratories and content server in every secondary school (MOE, 2015). This installation was not able to be finalised in ESDP III because in reality the process of ICT installation is not as simple as it was assumed to be in the ambitious policy document. Above all, ICT materials are physically bigger and more expensive than other ordinary education supplies. In addition, there were hidden factors that delayed the initial schedule. This led to the deterioration of the quality of teacher training and ICT teaching practices, which in turn led to poor student performance. These complexities and unexpected hurdles will be discussed throughout chapters 6 and 7 as critical factors of ICT implementation in education.

2.3.4.3. ESDP V

ESDP V is the fifth and last round of the ESDP educational programmes, which started in 2015/2016 and was in place until 2019/2020. The following two objectives of ESDP V are similar to the objectives of the1994 Education and Training Policy and of the previous four ESDPs (MOE, 2015).

Firstly, ESDP V once again prioritises the improvement of teacher quality via teacher training. ESDP V intends to motivate and encourage the hundreds of thousands of teachers in Ethiopia by implementing a strategy called 'transform teaching into a profession of choice' (MOE, 2015:56). The strategy aims to re-establish the prestige and value of the teacher profession in order to encourage teachers not to turn to other jobs. This includes a national media campaign to encourage social reflection and raise the image of the teaching profession within the public's mind. Although the strategy may not be considered a direct training programme, the government believes that this re-establishment, of the importance of the figure of the teacher, would result in improving teacher attendance and self-esteem. This links to work ethics and value of devotion for their professions. In turn, increasing teachers' social respect back would lead to the improvement of students' learning and achievement. In addition to this, ESDP V identifies that a great barrier to effective teaching practices is due to a lack of pedagogical skills. To improve this, ESDP V focuses on qualification standards and processes via both pre-service and in-service training. It planned to apply an evaluation guideline for teacher competency at a national level to all teacher training institutes (MOE, 2015). This included a full integration of ICT within the teacher training curriculum, which had not been properly achieved throughout TESO and PGDT. Moreover, the government provided English Language Improvement Centres to develop teachers' English language skills for instruction, which has continuously been a challenge in secondary education. The difficulties with the medium of instruction (English) has been frequently raised by educators and teachers and even found during classroom observation (see chapter 5 and 6).

Secondly, the government stresses the importance of relevant instructional methods including ICT. This means that the government considers ICT an important instructional method that affects quality and effectiveness of education. They believe that when teachers *properly* utilise ICT in the classroom, they could make the learning process simpler and smoother than conventional teaching. This is why most of teachers believed that ICT could make anything simple and fast (I expand on this in chapter 6).
Hence, the government has invested in ICT materials provision in order to fulfil their beliefs in ICT as a means to achieve quality education – with an aim to reach 100% satellite Plasma TV installation in secondary schools, compared with the 69% installation rate achieved during ESDP IV. (MOE, 2015). As IDI and NRI showed in section 2.2.1, it was difficult to fully implement ICT into secondary schools during ESDP IV due to poor ICT readiness.

In a nutshell, ESDP V aims at accomplishing 100% of Plasma TV installation, 50% of Internet access and 50% of contents servers (MOE, 2015). Subsequently, the government prepared for this installation to proceed under the scheme 'SchoolNet Cloud-Computing infrastructure', according to which every school would access digital contents stored in the central server of the Centre for Educational ICT (CEICT) (MOE, 2015:70). Furthermore, the content loaded in the server would not be a stand-alone subject itself but it would be designed to encourage pedagogical ICT usage (ibid). In this way, ESDP V aims to integrate pedagogy, content, and technology (ICT) to find the most appropriate ICT practices in teaching and learning processes (see chapter 3: TPACK). This assemblage of pedagogy, content, and ICT is particularly important because there will be countless ICT practices when individual teachers, who have different experiences and knowledge, meet ICT. Furthermore, the standard and relevance of instructional methods will be affected by subject content that possess different learning objectives and outcomes. The Actor-Network Theory and Sociomateriality will be studied in chapter 4 to understand this interdependent network constructed by ICT, teachers, and learning environment. In comparison to previous ESDPs, ESDP V tries to understand the relationship among pedagogy, content, and ICT that constitutes ICT-integrated teaching. When this approach combines with the emphasis on teachers' ICT awareness in ESDP IV, it might lead to different outcomes.

2.3.5. General Education Quality Improvement Programme (GEQIP)

GEQIP was designed during the implementation of ESDP III and it is a collaborative programme between the Ethiopian Ministry of Education and Development partners (henceforth DPs) through a pooled funding mechanism (MOE, 2008). The main aim of GEQIP is to improve the quality of general education in Ethiopia, interlinked with the main objective of ESDP. To pursue this aim, Ethiopia has closely worked with 15 DPs[9] which represent the Development Assistance Group (DAG) Education Technical Working Group. Although they have also addressed similar issues such as teacher training and ICT implementation, they may have ambitions to accomplish their own goals, which are not necessarily in line with the Ethiopian government. Nonetheless, the Ethiopian government maintained the lead of GEQIP implementation in order to achieve quality education by emphasising aid effectiveness, mutual accountability and government-owned programme (ibid).

2.3.5.1. GEQIP I

GEQIP I was implemented between 2009/2010 and 2012/2013 with the objective of improving the quality of education in Ethiopia. It consists of five components: (1) Curriculum, Textbooks and Assessment; (2) Teacher Development Programme (TDP) including English Language Quality Improvement Programme (ELQIP); (3) School

[9]15 DPs are as follows: African Development Bank, EC, Finland, Germany, Ireland, Italy, Japan, Netherlands, Sweden, UK, UNESCO, UNICEF, USA, WFP and the World Bank. Although they respect the government-owned programme, DPs also have influence upon both perceptions and practices of teachers. This will be discussed in following chapters.

Improvement Programme (SIP) including school grants; (4) Management and Administration Programme (MAP) including EMIS (Education Management Information System); (5) Programme Coordination and Monitoring and Evaluation (World Bank, 2008). GEQIP was designed to enhance the engagement and coordination of these five components, which were neglected in the past (MOE, 2008). Among the five components, component 2, teacher development programme (pre-/in-service), was an integral part of GEQIP I because the government believed that improved teachers' capacities could enhance the quality of education. This is a common point shared with TESO, PGDT, and ESDPs – the identification of the cause of poor quality of education lies in unqualified teachers. The innovation carried out by GEQIP I was dividing pre- and in-service training in greater detail compared to other policies. Firstly, in the case of pre-service training, GEQIP I extends the length of practicum programme for trainees (MOE, 2008). Trainees continuously mentioned the practicum extension, as a result of TESO, as an urgent requirement (see chapter 5). However, during interviews, some trainees indicated that their practicum was scheduled when school students were not attending school. These trainees were in PGDT, which means they were subject to the improved TESO version of practicum, but due to it being scheduled when there were no school students, the cohort could not practise what they learned in the classroom.

In addition to practicum, GEQIP I planned to provide a separate training for teacher educators offering pedagogical support (ibid). Although GEQIP I did not yet focus on ICT-integrated teaching, it regarded the pedagogical knowledge of teacher educators as important. As it focussed on teachers, it emphasised the importance of educators who trained trainees in the university. However, trainees' reflections regarding their instructors were not satisfactory (see chapter 5), with the consequence that the training programme was not viewed as satisfactory.

Secondly, with regard to in-service training, GEQIP I provided continuous professional development at school. This included English language training, particularly for secondary school teachers who have to use English as a medium of instruction (ibid). This is repeatedly mentioned by the interviewees I approached; they see the medium of instruction as a critical problem, that leads to ineffective communication between instructors and teacher trainees (see chapter 5). This is an important issue for both training institutes and working places (schools), because English proficiency of most trainees was not sufficient to fully understand and teach the subject-content. Under this circumstance, trainees struggled to digest and deliver what they studied in English. The teacher training of GEQIP links to a concept of the school effectiveness model (see figure 2.4) that results in effective teaching and learning (World Bank, 2000; 2008). Although

GEQIP I has not directly paid attention to ICT-integrated education, the school effective model could be an advanced preparation for bolstering up the potential of ICT integration from GEQIP II.

The five components encompassed the domains of school effectiveness but GEQIP I did not cover the physical environment of the school (see red circle in figure 2.4) because of a perspective that the sole investment upon physical environment of the school will not improve effective teaching and learning (World Bank, 2008). However, since the government concentrates on ICT-integrated education, GEQIP had been revised and added a separate ICT component in GEQIP II including physical environment improvement, alongside teacher training (World Bank, 2013).

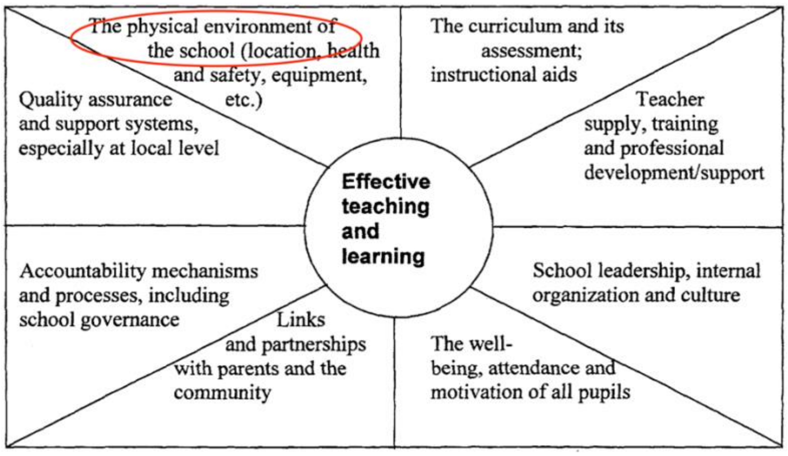


Figure 2.5 Domains of school effectiveness
Source: World Bank (2000)

2.3.5.2. GEQIP II

The second phase of GEQIP was implemented from 2013/2014 to 2016/2017 (World Bank, 2013). A major change in phase II was the incorporation of ICT as a separate component – which was the only added component compared to the first phase (World Bank, 2013). With respect to teacher development programme, outlined plans were very similar to GEQIP I, and included pre-service and in-service training. This means that the government continued with similar objectives, like the provision of qualified teachers via training. This requires a long period of time to accomplish the GEQIP objective – quality improvement.

GEQIP II allocates US $34.67 million to this new component, described as 'improving the quality of learning and teaching through the use of information and communication technology' (World Bank, 2013:12). The wording illustrates how ICT was at the forefront of quality improvement in GEQIP II combined with the five aforementioned components. In particular, three more subcomponents in relation to ICT are mentioned; (1) the development of ICT national policy and institutional management of ICT implementation; (2) the development of ICT infrastructure and provision of digital education contents; (3) teacher professional development in terms of ICT utilisation. The first subcomponent is straightforward and relates to the development of a regulatory environment for national ICT policy for education. The government officials pointed out the regulatory environment as an urgent issue that requires prompt action in order to achieve adequate ICT implementation in education (this is elaborated upon in chapter 7). Although it is a national ICT policy, as this field requires a large amount of external budget, international stakeholders also influence the process of policy-making and policy implementation. Hence, the direction of policies has the potential to be indirectly diverted by stakeholders. Chapter 7 will discuss stakeholders' reflections on policies and the process of implementation including teacher training policies and ESDPs.

When it comes to the second subcomponent, the government implemented a pilot plan before extending this across the nation. It selected 300 secondary schools and 10 universities based on prerequisite criteria in order to provide ICT-enabled quality learning (World Bank, 2013). With regard to ICT infrastructure, 300 secondary schools benefited from 80 computers (thin clients or terminals, more detailed information in chapter 6) with Internet connection in two computer labs. These facilities were expected to allow students to experience self-directed and self-paced learning via ICT (see chapter 6). However, in reality, various actors involved in the network of teachers' ICT utilisation and this involvement created unexpected beliefs and practices. These unexpected outcomes are not only caused by complexities of ICT materials, but they also occur when users (primarily teachers in this research) try to use ICT within the complicated network of ICT and education. This relationship will be explained via the lenses of two theoretical approaches: 1) Sociomateriality; 2) Actor-Network Theory, in chapter 4.

With regard to the third component, GEQIP II aimed to design an Ethiopian-relevant ICT competency framework, specifically for secondary school teachers (World Bank, 2013). Through this framework, both prospective and current secondary school teachers would have pre-service and in-service training particularly for pedagogical use of ICT in 10 universities and 300 secondary schools, respectively. The emphasis on pedagogical knowledge started from TESO and continued to PGDT, which is specifically designed for pedagogy improvement. This is why the balance of knowledge among pedagogy, content, and technology (ICT) will be discussed, not only in chapter 4 (TPACK) but also throughout the observation of teacher training institutes in chapter 5.

In spite of having a considerable amount of budget for ICT, GEQIP II was challenged by ICT procurement issues that prevented the Ethiopian government from accomplishing the pilot study with 300 schools (more on this in chapter 7). Under these circumstances, GEQIP II was phased out and Ethiopia has launched the next phase of GEQIP called GEQIP-E in July 2018. This new GEQIP phase will be discussed in the following section.

2.3.5.3. GEQIP-E

Since 2008, GEQIP I and II have been instrumental in improving a number of areas including curriculum revision, provision of learning materials, and teacher professional development (World Bank, 2017). For a decade, GEQIP has contributed US $957 million via a pooled funding mechanism by DPs (ibid). Although the amount of budget cannot be in itself a guarantee for the outcome of the programme, GEQIP I and II can be seen as having provided a valuable contribution to quality improvement in Ethiopian general education. For instance, the 2015 National Learning Assessment (NLA) was analysed with a focus on Grades 4 and 8 to monitor students' achievement. In NLA, there are four proficiency levels; (1) Below basic; (2) Basic; (3) Proficient; (4) Advanced. 57 percent of students (Grades 4 and 8) achieved basic or higher levels of proficiency, whilst 21 percent of students was increased to enrol in the two grades (World Bank, 2017).

Despite some improvement, three issues have still been raised as major difficulties in Ethiopian education, which the GEQIP-E is designed to tackle: 1) internal inefficiency; 2) inequity; 3) quality (World Bank, 2017). In the case of internal inefficiency, this arises because students do not enroll in the school system at the official age (see the discussion in section 2.2.2 on GER and NER). For instance, a large number of students (Grade 1) are over and under-age of official entry age, which is seven. This leads to large class sizes as well as shortage of learning materials, which decreases the efficiency of teaching and learning processes. Although GER and NER are getting lower in secondary and tertiary education, these challenges are still frequently present in teacher training institutes and in the secondary schools where I carried out my fieldwork (see chapter 5 and 6).

Inequity concerns primarily gender, special educational needs, disabilities and children in pastoralist communities who are often disadvantaged in education access (World Bank, 2017). Although these marginalised groups are not addressed in this thesis, the Ethiopian government also considers they should be beneficiaries of ICT-integrated teaching. However, due to a lack of finance and technology, the current policies only apply to some of the aforementioned inequities.

With regard to quality matter, GEQIP-E clearly states that poor teacher quality leads to poor quality of education and to low student learning outcomes. This issue has been raised often with reference to TESO, ESDPs, and PGDT, and has promoted an emphasis on teacher training. Nevertheless, teacher trainees are not satisfied with the training and some of them address their frustrations by undertaking additional training from private training centres, as I report in chapter 5 from my fieldwork data.

Apart from poor teacher quality, the quality of learning environment is also considered a major contributor to disappointing outcomes (see chapter 6). According to GEQIP-E, 83 percent of secondary schools did not meet the national standard of learning environment between 2013/14 and 2015/16 (World Bank, 2017). As mentioned above, an ICT-related learning environment is difficult to implement in every classroom due to a budgetary deficit. That was why the government was only able to run a pilot study with 300 secondary schools before expanding the study at a national level. However, the completion of the pilot study does not mean adequate level of ICT utilisation but it simply means the completed installation of ICT materials (see chapter 6 and 7).

Importantly, GEQIP-E dramatically reduced the budget for ICT from US $34.67 million to US $250,000 (World Bank, 2017). The major reason of this budget cut is that DPs are not convinced by the capacity of the Ethiopian government in relation to the programme management. For instance, the expected schedule for ICT infrastructure installation in 300 schools was May 2018, but it was prepared only recently. The complications linked to both procurement and installation delays will be described in detail in chapter 7.

Nonetheless, the Ethiopian government would like to keep expanding ICT provision, but it is unable to assure the DPs that delays will not happen again. Above all, it is not possible to assess how schools utilise the received ICT materials, and therefore difficult to ascertain whether the government is achieving the planned outcomes. This is why DPs prefer that GEQIP-E would rather concentrate on reviewing challenges to ICT implementation and policy recommendation. In addition, GEQIP-E will collaborate with ESDP V to implement school-based, both pre-service and in-service, professional development – which is meant to make teaching practices more effective and practical (World Bank, 2017). For example, school directors are encouraged to monitor lessons and classroom activities, through meetings with teachers to discuss student learning achievement and classroom practices.

2.4. Conclusion

This chapter has described the context of the thesis, specifically, Ethiopian ICT-related educational and teacher training policies that are designed to promote ICT-integrated teaching in the classroom. Ethiopian government has actively implemented and kept developing teacher training curriculum (TESO and PGDT), ESDPs, and GEQIPs because the government foresees a genuine potential for ICT to improve both economic development and education quality improvement. Although the COVID-19 will slow down the current socio-economic development trend, the government believes ICT is one of the main enablers to help Ethiopia reach lower middle income status by 2025 (World Bank, 2019a; World Bank,2020).

The main objective of ICT integration into Ethiopian education is to standardise the poor quality of education caused by unqualified teachers and regional disparity (FDRGOE, 1994).The government believes that ICT in education could reduce this regional gap and the fundamental step to achieve this is to produce qualified teachers who actually utilise ICT in the classroom (MOE, 2003; Kassanhun, 2006). This is why every aforementioned policy stresses teacher training along with the provision of ICT materials. When it comes to the teacher training curriculum, TESO was the first curriculum overhaul aiming to improve the quality of education (MOE, 2003). It primarily concentrated on both the extension of practicum hours and addition of new courses, including a separate ICT course (Mekonnen, 2008). However, TESO was not enough to produce qualified teachers so the government revised and updated to PGDT, which specifically focuses on improving teachers' pedagogical skills (World Bank, 2017). It is important because having ICT does not guarantee teachers' ICT utilisation in the classroom. Despite the improvement in both TESO and PGDT, there is no difference between TESO and PGDT graduates in terms of ICT-integrated teaching. The examination of factors that prevent or enable ICT implementation will be discussed in the empirical chapters (5,6, and 7).

In comparison to the teacher training curriculum, ESDPs and GEQIPs were implemented to improve the quality of Ethiopian general education. Specifically, this chapter has focused on those policies with regard to ICT-related teacher education and materials provision. Firstly, ESDP is designed to improve accessibility, quality, equity, and effectiveness in the whole Ethiopian education system (Martin, et al. 2000). When it comes to ICT, ESDP III was the first policy that specifies ICT implementation in education and PTI was introduced as a representative ICT-integrated teaching (MOE, 2010). ESDP IV has a separate component for the use of ICT, which emphasised teachers' ICT awareness and confidence in order to encourage the ICT practices (MOE, 2010). Although it stressed teachers' psychological readiness for the first time, the actual policy implementation was rather concentrated on ICT material installation, including Plasma TV and computer laboratories. To improve this, ESDP V again tried to re-establish teachers' self-esteem and societal respect via providing more detailed pre-/in-service training (MOE, 2015). In addition, ICT materials were also targeted to achieve 100% installation so that teachers could fully utilise more relevant instructional methods in the classroom.

Secondly, GEQIP mainly aims at improving the quality of general education but the difference with ESDP is in the funding body (MOE, 2008). Although the Ethiopian government still takes the lead, DPs are funder bodies, which sometimes pursue and prioritise their own educational objectives. Nevertheless, with regard to ICT and education, GEQIP invested in a teacher development programme as a fundamental preparation and prerequisite to quality improvement. A direct full-scale investment in ICT and education was prioritised in GEQIP II (World Bank, 2013). This led to a pilot study with 300 digitised schools that intended to install 80 computers in two computer labs and the Internet connection (ibid). However, this study has been delayed even from taking a first step due to problems with procurement and installation. Subsequently, it was not possible to assess the outcome of the pilot study that was the major foundation of GEQIP. Beyond installation delays, the complexities of the Ethiopian ICT and education system led to other unexpected results including budget cuts by DPs (World Bank, 2017). Because of this, teachers could not receive adequate levels of training – which in turn led again to the inability of the system to produce appropriately qualified teachers. Unfortunately, in the future the provision of ICT materials might remain the same because of DP budget cuts. These difficulties and realities of ICT implementation in teaching will be discussed in further detail in the three empirical chapters.

CHAPTER 3: Theoretical framework

3.1. Introduction

In chapter 2, the thesis described the commitment of the Ethiopian government to ICT and education, and how that is emphasised as a government priority. As the government initiatives in ICT require a new design from teacher training to the classroom teaching, the process of ICT implementation is complex and has to include not only teachers and students but also ICT materials and stakeholders. As I have argued, teachers are considered a fundamental element for ICT implementation, and they are often the first to be blamed when this fails (Ghavifekr and Rosdy, 2015; Olsen, 2015; Olofsson et al., 2017; Player-Koro and Beach, 2017). However, this thesis argues that in order to achieve a sustainable ICT-integrated teaching, it is important to explore the full network of actors that inter/intra-act in the field. In particular, the contribution of materiality to education and its relationship with teachers needs to be considered as a key area to investigate. The investigation into the relationship between materiality and teachers can help explain the extent to which teachers implement ICT into teaching practices in the classroom, and which factors foster or hinder implementation.

This chapter develops as follows. Section 3.2 will introduce Sociomaterial approaches, which give importance to both social and material factors and take into examination their interplay. Investigating the entanglement of social and material forces will help to examine how the teachers' beliefs and teaching practices are constructed in relation to ICT. Discussing the basis of Sociomaterial approaches, in section 3.3, the chapter will take Actor-network theory as a major theoretical tool to further investigate Ethiopian teachers' beliefs and practices towards ICT. In the section 3.4, other concepts relevant to teachers' ICT practices will be briefly discussed – in particular, teachers' beliefs and Technological Pedagogical and Content Knowledge. Lastly, section 3.5, the chapter will synthesise the relevance of these different theoretical approaches outlining why they are integrated in this study.

3.2. Sociomaterial approaches

In general, researchers in the area of science and technology studies consider social, cultural, and personal factors to be important and take human-centric perspectives when they carry out their investigations (MacLeod et al., 2015). In the same vein, the role of material factors have been considered as peripheral, as these factors would simply be tools subsumed under human intention (Fenwick, 2015).

There has been a growing interest in materiality that challenges the human-centric approach. The perspective of Sociomateriality understands these two entities (the social and material) as being distinct and yet inextricably linked in a complex relationship (Barad, 2003; Latour, 2005; Suchman, 2007; Simons, 2016). The social aspect relates to human-related action: ideas, symbols, cultural discourses, desires, fears, and practices; whereas the material sphere encompasses the everyday component of life including animate and inanimate, technological, and natural: pencils, paper, computers, email, and spaces (Fenwick, 2015; Barry, 2018). In this way, Sociomaterial approaches argue that the two entities are of similar importance and their relationship forms society. This is why the division of social and material spheres, while conceptually neat and clear-cut, becomes blurred in practice: because both are mutually constitutive of the human experience and interpenetrate one another – in what can be seen as relational ontology (Leonardi, 2011; Tunçalp, 2016). In the same vein, Barad (2003:821) argues that the Sociomaterial approach “does not fix the boundary between human and nonhuman”. Orlikowski and Scott (2008) argue that daily life is made up of the mixture of social and material, which blurs the distinction between two elements. They treat the social and material entities as equally important because continuous assemblage or dissolution of their interaction consist of everyday life, knowledge, and environments (Fenwick, 2015). That is why researchers investigate how and why these assemblages are connected or disconnected. Materials are considered as performative when they come together with others to produce agentic assemblage (ibid). On this account, Bennet (2010) argues that agency is given to materials through assemblages when humans infuse their desires and interests in materials. What the Sociomaterial perspective points out is how agency is distributed in webs of human and nonhuman relations – rather than where agency is located. Hence, the Sociomaterial approach is suitable for examining social phenomena and practices which concentrate on the interwoven interactions between social and material environment such as the use of ICT in education (Bhatt and de Roock, 2013; Harris and Abedin, 2015). In this thesis, the interpenetration between teachers and ICT materials will be looked at through a Sociomaterial perspective, whereby the agency of teachers and ICT materials influence one another, to understand their interconnected relationship.

3.2.1. Sociomateriality in educational research

Waltz (2006) pays attention to material (non-human) things because such materials have been subjugated by human ends that underestimated the actual contribution to education. In addition, Sørensen (2009:2) argues that there is a “blindness toward the question of how educational practice is affected by materials.” To explain performative engagement of materials, Waltz (2006) uses the school playground as an example which actively combines with children’s behaviours to create multiples types of learning. With this example, he points out the relations among children and the materials – which produce gender identity, knowledge and social structure via their relation to other materials. In other words, human (children) and non-human (playground) would stitch together and encounter both patterns and unpredictable educational activities and practices (Fenwick and Landri, 2012). The focus of the Sociomaterial is therefore not simply about the presence of materiality but about how the material and the social are assembled in educational practices (Johri, 2011). In addition, individuals’ skills or agency may be only a small part of assemblage for educational practices. That is why scholars need to carry out research into what the assemblages of human and non-human materialities bring about and which range of effects they produce (Fenwick and Landri, 2012; Fenwick, 2015).

On the basis of a Sociomaterial perspective, the next section will discuss the Actor-network theory which will be the main theoretical tool for examining the interaction between human and technology in this thesis.

3.3. Actor-network theory (ANT)

3.3.1. Science and Technology Studies theories before ANT

Technological determinism and the ‘social construction of technology’ (henceforth ‘SCOT’) present dichotomous approaches to human interaction with technology. In a nutshell, technological determinism emphasises technology as a fundamental factor for changing society and shaping culture (Jordan, 2009). Normally, it does not include any sociological meanings in reference to the development of technology. By contrast, SCOT argues that social groups of users may understand the same technology or artefact in different ways (Kline and Pinch, 1996). In other words, human and societies are capable of shaping the objectives of technology.

3.3.2. Actor-Network Theory (ANT)

Rather than being situated in either technological determinism or SCOT, Actor-Network Theory (henceforth ANT) transcends those binary oppositions and positions itself in the middle of two debates (Cordella and Shaikh, 2006). In common with sociomateial approaches, ANT focuses on the relation between human (social) and nonhuman (material) elements that constitute an everyday basis of the human experience. This generalised symmetry position of ANT [in considering human (social) and nonhuman (material) elements] explores how things work when humans and nonhumans are associated into a network and how these linkages are connected, sustained, served, or reformed (Latour, 1987; Harty, 2008; Zhang and Heydon, 2016).

According to Cressman (2009), the three most influential authors in the development of ANT are Michel Callon, Bruno Latour and John Law. Although ANT is not easy to summarise or define, it starts to concentrate on the voice of technology (non-human), which has previously largely been ignored, and emphasises the connection between technology (non-human) and people (human) (Cordella and Shaikh, 2006). For instance, in ANT, technologies, bacteria, texts, furniture, chemicals (defined as 'actants') are treated like humans and are supposed to influence each other by forming and dissolving networks (Fenwick and Edwards, 2010). On the basis of this idea, Latour argues "Society is constructed, but not just *socially* constructed" (Latour, 1994:793; 1999:198). Furthermore, Law insists that successful social practices are derived from 'heterogenous engineering' processes, which bring the social, technical, and conceptual aspects together and keeps these together (Law, 1987:114; Frickel, 1996). What they have argued lies in a hybrid disciplinary positioning between technological determinism and SCOT (Stalph, 2019). As mentioned, for example, ANT does attribute great importance to technology (non-human) that is performative by itself *'as human'*. This symmetrical perspective stresses the contribution of technology to the relation between human and non-human that forms, changes, and informs everyday situation (Hansson, 2015).

The core idea of ANT is acknowledging an agency of technology, and the agency of technology is explained by Latour across many different forms of technologies, such as a door closer, key, speed bump, and an automated train system (Latour, 1992; 1996). Latour paid attention to the agency of non-human (particularly technology) in a similar way to cosmologists who explore 'missing mass' to make up the total expected balance in the universe (Latour, 1992:152). He argued that it is time for us to turn our attention from human and focus upon non-human, which has been the 'missing mass' in social theory (ibid). For instance, the agency of a door closer can be proved when the malfunctioning door closer makes people pass the door quickly (Latour, 1992). This clearly shows the agency possessed by the door closer because not only does it replace the human, but it also affects humans to behave in a particular way. Moreover, technology or artefacts, which are made by human, is sustained for a long time and playing critical role within the network (Latour, 1986). To create this actor-network system, multifarious human and non-human actors connect each other and either align with an existing network or produce a potential network (Keith and van Belle, 2014; Zhang and Heydon, 2016). This is about how networks 'form, reform and dissolve' (Fenwick and Edwards, 2010:59), and this process is called *translation*. Translation indicates the process of change when the human and the non-human are connected to form their link (Latour, 1987). In an influential paper by Callon (1986), he described this as occurring in four steps; 1) problematisation; 2) intéressement; 3) enrolment; 4) mobilisation. During the four steps, it is crucial to make other actors dependent upon the focal actor (central actor within the network) in order to propose other actors to join the network. To do so, making an obligatory passage point, which draws other actors to proposed network, is the main mechanism in the translation process. In the end, once this network becomes stabilised, it is accepted and becomes part of a 'black box'. The black box normally assumes the form of technology which consists of the network (society or human and non-human collective) and is considered as a core part for maintaining the network.

From the ANT perspective, the power of human actors is not privileged in terms of successful translation or maintenance of the network (Callon and Latour, 1981). In addition, the stability of a network is informed by the material nonhuman, which is enrolled into the network as allies by human actors. Callon and Latour (ibid) name powerful human actors as macro-actors and the more these mobilise stronger non-human entities into the network, the more stable network is constructed. That is why they state that "macro-actors are micro-actors seated on top of many (leaky) black boxes." (ibid:286). Black box means technology that makes this successful translation process possible and macro-actors. Thus, Latour argues that power comes from technology in the modern societies and even describes laboratories as 'the future reservoirs of political power are in the making' (Latour, 1983:168).

As discussed above, ANT understands the society as human and non-human collective and this evolves in different forms which start from the translation process (Latour, 1999). Once the collective has gone through this process, it ends up having a new form and a new direction. This is *displacement* and it represents the last stage of changing to the new collective. However, it should be kept in mind that this will not stay the same forever, because there will be continuous displacement when a new technology is introduced into the human and non-human collective.

3.3.3. ANT in educational research

Despite the fact that ANT is rooted in sociology of science and technology studies, it has extended its applied areas to sociology, anthropology, medical education, management studies, basic education, and teacher education (Hamilton, 2009; Fenwick and Edwards, 2010; Bleakley, 2012; Tummons, 2014; MacLeod et al., 2015). ANT is increasingly used in the field of education, in order to shed light on the relationship between human (teacher, students, and technicians) and non-human (blackboard, desks and chairs, electricity, and computers). This relationship reflects on how these two entities are situated, interact in the network and influence one another to constitute educational pedagogy, curricular, technology, and leadership (Green et al., 2018; Tummons et al., 2018). By employing ANT in educational research, it is possible to investigate the interrelations of diverse actors such as teachers, students, school policies and technologies, which form the dynamics of change and network (Samarawickrema and Stacey, 2007; Fenwick and Edwards, 2010).

A number of studies employed ANT as their theoretical tool. Firstly, Richard Edwards discusses how curriculum-making occurs through employing the concept of translation (Fenwick and Edwards, 2010). The case study is about vocational cooking skills class in a school in the UK. It shows diverse networks taking place during the class, including conversations and tastings. His study looks into the objects in classroom, which include the students' iPods, knives, pots and smells, and how they may influence the curriculum-making process. By tracing the process of chaining human and non-human actants (translation), he concludes how curriculum-making is heterogeneous.

Tara Fenwick explains how ANT can analyse the tensions between networks especially in the process of educational reforms (Fenwick and Edwards, 2010). She depicts the school improvement initiative in Alberta, Canada, that aimed to enhance students' achievement. Throughout this educational reform, she traced a number of networks which engage in this reform process. The reforms are derived from the tension which is created by assemblage among policy enactment, counter networks and translations. Thus, Fenwick identifies not only policy enactment in this educational reform but also counter networks and translations which are easily neglected by other theories. Keith and van Bell (2014) observed the interaction of staff and students both on- and offline environment. In particular, they analyse how a Facebook page is used to facilitate the internationalisation process in the University of Cape Town by examining each translation process of ANT.

Zhang and Heydon (2016) study an Ontario literacy curriculum in a transnational education programme delivered in Southern China. Their research explores actors that produce the literacy curricula, particularly the changing the nature of curricula via ANT's translation process. Filho and Kamp (2019) conduct a study that investigates the change of social capital of Brazilian mobile students. The research is based on Bourdieu's contribution on social capital but brings in the idea of ANT to analyse the assemblage with non-human actors. For instance, it includes housing, transportation, visa, and social and cultural norms as heterogeneous actors that affect students' involvement. These studies are examples of how ANT can be a suitable theoretical lens, which in particular sheds light on the contribution of 'mundane masses' to the field of education (Neylund, 2006:25). For instance, they have represented the assemblage of mundane materials with human influences to wider contexts such as curriculum-making process, educational reforms, internationalisation process, literacy curricula, and students' involvement. This would link to the (re)formation and dissolution of network between Ethiopian teachers and ICT materials that result in ICT practices in the classroom.

3.3.4. ANT in ICT-related research

A number of studies indicate that ANT is a useful theoretical tool particularly when they examine the trajectory of ICT development, implementation, and ICT adoption by people. Allen (2004) magnifies one translation process in ANT, enrolment and explains how personal digital assistant (PDA) industry can be successful. He introduces ANT as 'one of the most popular and influential approaches' in IT (Information Technology) research (ibid:171). Faraj et al. (2004) apply ANT as a basis for investigating the development of Web browser technology, which has been largely neglected by scholars because most of research focuses on either adoption or adaptation of technology by users. Tatnall and Lepa (2003) inquire into the reason of Internet and e-commerce adoption level among older people. On the basis of an ANT perspective, they trace the factors that make some older people adopt the two aforementioned technologies. Similarly, Hannemyr (2003) also examines the Internet adoption rates building upon ANT as a theoretical framework.

ICT-related research is not limited in technologically advanced contexts. For instance, Walsham and Sahay (1999) conduct a longitudinal study in India on the Geographical Information Systems (GIS). They use ANT for analytical purposes and find how difficult it is to achieve a stable set of network when actors (US and India) have different perceived interests with GIS technology. In a similar vein, Gao (2007) explores the interest conflict in relation to technology standardisation in China from the perspective of ANT. With the network failure, the research provides lessons for developing countries which may face or be in a similar situation. Heeks and Standforth (2007) investigate the Sri Lankan e-government project with the ANT's idea of local and global networks and their inter-relations. These pieces of research show the insight of ANT in relation to either network success or failure caused by the relationship between human and non-human actant.

3.3.5. Critics of ANT

Although ANT can be appropriate to both education and ICT-related research, it has attracted widespread criticism, even concerning its name. Although ANT has the word 'theory' in its name, it has been criticised because it does not provide enough explanatory framework as other theories often do, especially for empirical studies (Quinlan, 2014). In addition, ANT has also faced criticism primarily because of its inability to incorporate basic factors of crucial importance for social sciences – such as gender, race, power structure and a range of socioeconomic inequalities (Star, 1991; Casper and Clarke, 1998; Wajcman, 2000). For instance, between the 1990s and early 2000s, feminist scholars bitterly criticised ANT because it did not pay attention to women, marginalised race groups, or people with disabilities (ibid). Star (1991) and Wajcman (2000) argued that it is not able to find vulnerable groups in the texts and tools of Latour's narrative of law and science. In other words, ANT would not be able to work in the way Latour explained and described with these marginalised groups as its actors. Moreover, ANT is only able to describe what happens throughout social processes, yet it does not explain why those processes occur. Above all, in relation to power and politics, Reed (1997) argued that ANT's symmetrical perspective upon the human and the non-human neglects the opportunity distribution which is normally given in hierarchical order. In other words, in reality, power is not evenly distributed and ANT disregards this fact and the way this impinges on societies. As a result, Winner (1993) points out that ANT's political analysis is limited, and able to provide only a surface-level description. To overcome these weaknesses of ANT in this thesis the next section will take into examination other concepts which could supplement both Sociomaterial approach and ANT, particularly for conducting this research in the Ethiopian context.

3.4. Other concepts in relevant research

Although Sociomateriality and ANT will provide the primary theoretical lens for this thesis, this research will make use of two additional concepts that have also been used in other relevant research.

3.4.1. Teachers' beliefs

The first concept is teachers' beliefs, particularly concerning ICT. Nespor (1987:322) describes beliefs as 'framing or defining tasks'. He argues that beliefs determine what problems and tasks are and individuals use their beliefs to solve problems (Pajares, 1992). In this case, teachers' beliefs are an important indicator in order to understand teaching practices (behaviours) (Ajzen and Madden, 1986; Pajares, 1992). Although the beliefs of teachers could be dependent upon individuals' life experience, teacher professional development strongly affects teachers' beliefs (Kagan, 1992). Hence, teachers' beliefs have been linked to either pre-service or in-service teacher training and as such, studied in different contexts such as the UK (Blay and Ireson, 2009), Spain (Cano, 2005), the United States (Sanger and Osguthorpe, 2011), the Netherlands (Meirink et al., 2009), Turkey (Isikoglu et al., 2009), and China (Correa et al., 2008).

As those studies indicate, the correlation between teachers' fundamental beliefs and practices as well as the examination of teachers' beliefs in ICT will be helpful to find the relationship with ICT practices in teaching. Ertmer (1999) sheds light on barriers that determine the degree of technology integration among teachers and what she emphasises is intrinsic factors, which she labels as *second-order barriers*. Ertmer (2005) argues that ICT-integrated teaching practices are not effective when the second-order barriers are not overcome, even if ICT materials and teachers' knowledge (*first-order barriers*) are fulfilled. In other words, the degree of ICT integration into teaching is difficult to be improved without changes in teachers' beliefs (second-order barriers). This thesis will therefore integrate teachers' beliefs within ANT and wider Sociomaterial perspectives. In particular, 'network failure', as the disconnection between teachers and ICT practices will be considered in relation to the challenges and disruption observed in ICT-integrated teaching practices. Hence, Ethiopian teachers (focal actors)' beliefs in ICT will be considered in relation to both first-order (material) and the second-order (social) barriers.

3.4.2. Technological Pedagogical and Content Knowledge (TPACK)

The second concept worth discussing is the framework called Technological Pedagogical and Content Knowledge (henceforth TPACK). TPACK introduces technological knowledge in the framework of Shulman (1986)'s pedagogical content knowledge (PCK), with the aim to encourage and support an effective teaching practice with technology (Koehler and Mishra, 2009). Technological knowledge is included because it is not possible to implement technology into teaching without understanding the relationship among technology, pedagogy, and content (Hughes, 2005).

The nature of teaching is complex, and according to Koehler and Mishra (2009) these complexities get more complicated when technology enters the field of education. In the past, with traditional technologies (pencils and chalkboards), it was straightforward for teachers to learn and practise those technologies in the classroom because they were simple, stable, and intuitive (Simon, 1969). By contrast, digital technologies are volatile, unstable, and complicated, so that teachers may find it difficult to update their knowledge and apply it to the classroom (Papert, 1980; Turkle, 1995). This is because digital technologies are changing rapidly and are used in unexpected ways across different contexts. To prevent ineffective technology engagement, teachers need to have a clear guideline and support from teacher training. In fact, most teacher training focuses on technology itself rather than pedagogical practices of technology (Harris and Hofer, 2011). However, TPACK emphasises how to interweave pedagogy, content, and technology from teacher professional development (Mishra and Koehler, 2006). Otherwise, teachers cannot gain appropriate experiences with ICT and become (or remain) competent to practise ICT for teaching practices. The resulting incompetency brings about a devaluation of ICT in the teaching and learning process (Koehler and Mishra, 2009).

In short, what TPACK argues is that there is no single solution to integrate ICT in teaching practices because each teacher will face 'a unique combination of three factors (pedagogy, content, and technology)' and will therefore experience idiosyncratic challenges (Mishra and Koehler, 2006; Koehler and Mishra, 2009:66). Moreover, contextual factors such as social and institutional characteristics will also play a role, making the situation even more unique – diminishing further the chances that teachers' teaching practices could be uniform (Harris and Hofer, 2011). That is why technology intervention in teaching (education) requires more thoughtful and creative pedagogical design depending upon subjects and classroom context (Mishra and Koehler, 2006; Koehler and Mishra, 2009). This will be linked with the ANT and Sociomaterial perspectives because a combination of Ethiopian TPACK and contextual factors will determine the ICT teaching practices of teachers. It is important to stress that, pedagogy, content, and technology are all considered as actants that construct the network of ICT teaching practices.

3.5. Theoretical rationale and framework for this study

This section summarises how the different theoretical perspectives are brought together in this study. The chapter has discussed the Sociomaterial approach and ANT, focussing on how they are used in educational research. Their symmetrical perspectives on social (human) and material (non-human) are a distinctive characteristic which highlights the importance of the agency of non-human actants which is ICT (digital technology) integration into education in this research. This leads to more complicated assemblage between human and non-human because technology is a set of techniques (artefacts), which are located within social production including economic, political, social and historical characteristics (Lemonnier, 2002). Moreover, symbolic and representational sets of ideas are revealed in technology because any technique (artefact) represents its mental schemata with physical manifestation (ibid). In other words, practices of technology need to consider not simply technology itself but its value for individuals as well as society. Thus, technology implementation is difficult to fully take place without understanding the surrounding society.

With this theoretical lens, this thesis explores the assemblage of social context and ICT materials which results in either a stable network of teachers and ICT practices or a potential network failure. This enables an analysis of Ethiopian teachers' beliefs in ICT and practices. In fact, there are few studies that have identified the reasons why the Ethiopian government has been challenged by the integration of ICT into education in more general scope (Abera, 2013; Ahmad, 2013). Studies from Abera (2013) and Ahmad (2013) inevitably do not consider the fundamental element, teachers who actualise ICT implementation into the classroom (Lawless and Pellegrino, 2007; Almerich, et al., 2016). Although teacher training is one of the crucial factors, the beliefs of teachers in ICT have not been studied by any research in Ethiopian ICT and education context. Abera (2013) solely concludes that the promotion of ICT awareness needs to be prioritised for successful ICT implementation in education.

While the topic of research has recently narrowed down by researchers to teacher and teacher training (PGDT), their foci were not on ICT-related training and implementation (Tegegne, 2015; Abejehu, 2016; Fite and Rekissa, 2017; Mekonnen, 2017; Shishigu et al., 2017). The scope of those studies reveals a gap consisting in the fragmentation between teacher training and classroom implementation. This fragmentation means they are not able to scrutinise beyond either the teacher training college or secondary school classroom. In addition, more seriously, either teacher training or classroom ICT integration has not addressed ICT and ICT-related material themselves as independent agencies. Most of the research rather argues that the shortage of those materials causes challenges to ICT implementation. They neglect the investigation into both individual and social value of ICT materials which determines the actual ICT practices of teachers. For instance, if ICT possesses complicated and troublesome impression, teachers might not voluntarily utilise it for their teaching. Contrary to the previous research, this thesis will bridge this gap by employing Sociomaterial approach and ANT to analyse the relationship between teachers and ICT materials under the current Ethiopian secondary education circumstances.

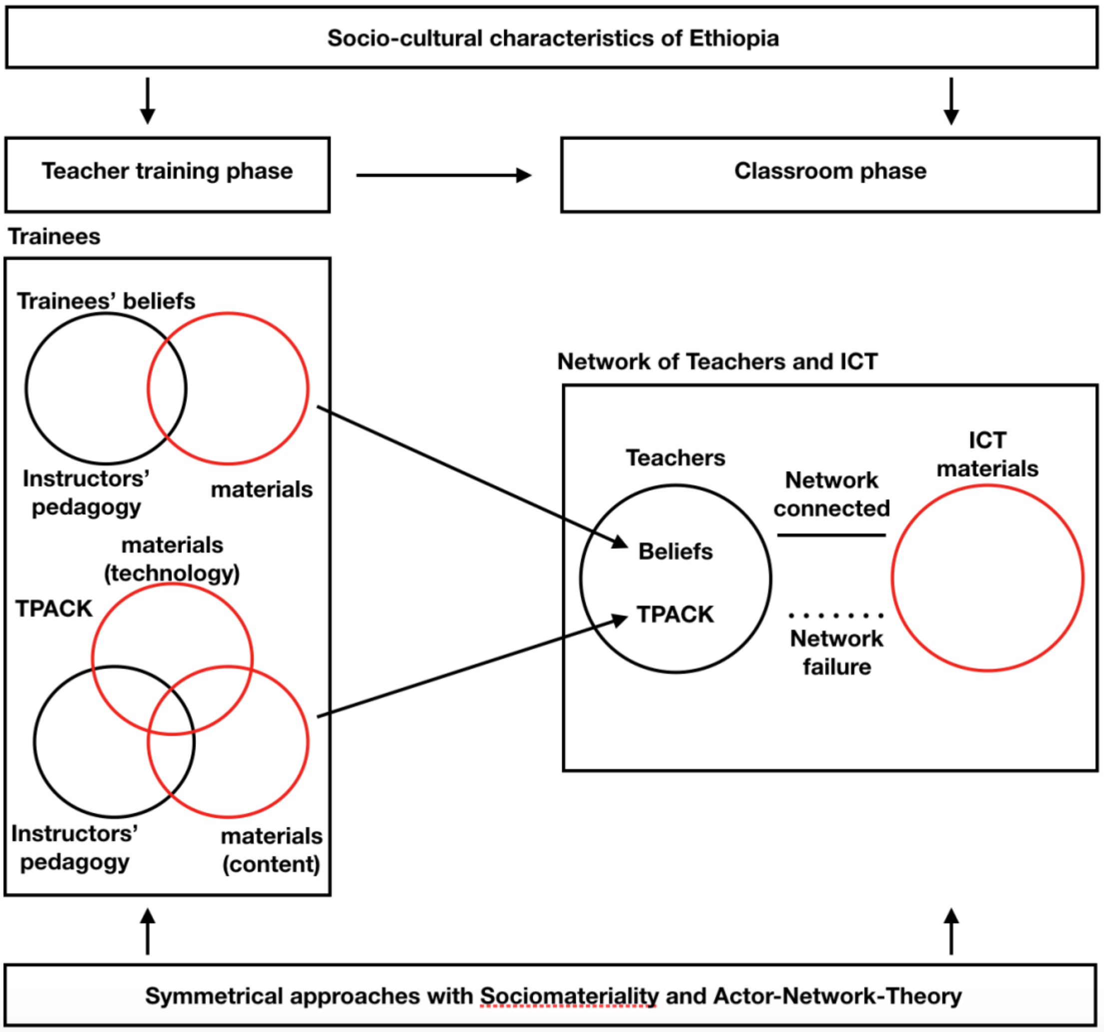


Figure 3.1 Theoretical configuration for this thesis
(drawn by author, with the three-circles of TPACK borrowed from Koehler and Mishra (2009:63))

As Sociomaterial approach and ANT understand society as a collective between human and non-human, this thesis will apply this viewpoint as a theoretical foundation in order to investigate teacher training and ICT practices in the classroom (see figure 3.1). First of all, in teacher training phase, this thesis will start to examine the agency of both instructors' pedagogy and ICT materials which constitute trainees' beliefs in ICT. In addition, the interweave of three knowledges will be examined because it determines the efficiency of ICT implementation inside of the classroom by trainees (prospective teachers). This training phase is the initial node of the network that is composed of teachers and ICT. Secondly, in classroom phase, this research examine teachers' beliefs that is primarily constructed during the training phase. Both training and materials could affect teachers' beliefs and TPACK which either connect or disconnect (network failure) with the ICT materials. This (dis)connection leads to ICT-integrated teaching practices in the classroom. With a symmetrical viewpoint, humans (teachers) are considered as nonhumans (ICT materials and material settings), but this is incomplete as we ought to consider how humans hold values and their practices are determined by individual beliefs. In this way, ANT does not sufficiently give the value to the intimacy of what it means to the human. For example, school learning environment (material settings), government educational policy, and inherent images in ICT itself within Ethiopian society get entangled with teachers and create teachers' beliefs in ICT that determine teaching practices with ICT.

In addition to teacher training and ICT practices, stakeholders (national, international, and private sectors) will be investigated because they actively engage in the network of Ethiopian teachers and educational ICT practices. Although their engagement may seem to be limited to either policy initiatives or material provision, these could be understood as another form of relationship between human and non-human. As a result, they have experienced (re)formation and dissolution of the network and found the potential network failure caused by other surroundings.

3.6. Conclusion

This chapter has discussed how the thesis will bring together the ANT framework and Sociomateriality with teachers' beliefs and TPACK, to analyse the Ethiopian teachers' beliefs and practices in relation to ICT. Although this study attempts to explore teachers' beliefs and practices, the framework regards the contribution of non-human (materials) to human behaviours. This perspective is the reason why ANT as well as Sociomateriality have been examined throughout this chapter – because they help to understand how teachers and ICT materials collectives entangle or disentangle. As stated earlier (in 3.2.1, 3.3.3, and 3.3.4), other educational and ICT-related research have also showed that this symmetrical perspective is suitable for studies of human assemblage with technology (e.g. Harris and Abedin, 2015).

Nonetheless, these would not be enough to specifically understand the Ethiopian teachers' beliefs in ICT and practices. Hence, the chapter has looked into two further concepts (teachers' beliefs and TPACK) that could support the analysis of what influences the network of teachers and ICT materials, particularly for ICT implementation in teaching practices.

Previous studies on Ethiopian ICT and education remarked that teachers' poor ICT practices were a result of either the existing system of teacher training or the shortage of ICT materials. However, what they have neglected was value and agency of ICT materials which construct teachers' beliefs as well as practices of ICT. The teacher training and classroom are primarily two spaces where teachers (trainees) could be deeply exposed to ICT materials. That is why the influence of pedagogy and materiality on trainees are investigated to understand primary contributors of the network between teachers and ICT from teacher training to the secondary schools.

Before exploring the empirical chapters (5, 6, and 7), the next chapter will explain how and why this research employ selected research methods for collecting data. In addition, it also depicts the situation during the state of emergency and illustrates the process of fieldwork such as finding a research affiliation and sampling.

CHAPTER 4: Methodology

4.1. Introduction

The goal of this chapter is to explain the research approach I followed, including the entire procedure of my fieldwork, research methods, data collection instruments, data analysis, the affiliation I had in the field, and the rationale for participants and organisations selection. Ethiopia already declared a state of emergency before I embarked on my fieldwork. Hence, restrictions were introduced before and during my fieldwork - eight months of which were during this state of emergency. Of all restrictions, those relating to the use of the Internet and mobile data was the biggest challenge. In addition, traveling to other regions, particularly near the Western and Eastern borders was prohibited to as a foreigners unless for essential reasons. Thus, I was not able to reach other regions to carry out my research, and consequently other researchers in the team I joined were in charge of the data collection outside the Addis Ababa region.

For this research, ethical clearance was obtained from the Ethics Committee at the School of International Development, University of East Anglia. This covered detailed ethical concerns, including safety during data collection, voluntary participation, safe data storage, guarantee of anonymity, care for situations of possible dependent relationship and respect of local culture, norm and values. Before any interview or observation, a careful explanation of the research objectives and processes was provided to participants, together with my contact and the assurance that they could withdraw at any point. The explanation was given both verbally and through a consent form, and included an account of how the data will be presented and used for the production of my thesis. If the participants were not familiar with English, they could share their thoughts in Amharic through an interpreter. I also avoided attitudes or situations which may induce pressure onto participants, aware of the 'asymmetry of power' between researcher and interviewees (Qu and Dumay, 2011).

The remainder of the chapter is organized as follows. Section 4.2 below describes the research methods that were employed to collect the data. Section 4.3 explains the research analyses of the data collected from semi-structured interviews, classroom observation and document analysis. Section 4.4 explains the state of emergency and the steps I undertook to find affiliation under the state of emergency. Section 4.5 provides the rationale of sample selection: 1) organisations; 2) interview participants. Section 4.6 discusses my positionality during the research to explain how I endeavour to reduce the chance of biased outcomes. Section 4.7 shows the reality of Ethiopian's ICT utilisation during the state of emergency. Section 4.8 concludes.

4.2. Research methods and instruments

In the field of ICT for development within the educational sector, research methodologies such as case study research, participatory research, surveys and interviews are deemed able to strengthen research findings (Korpela et al., 1998; Choudrie and Harindranath, 2011). As this research has a specific focus on teachers' beliefs and their practices in relation to ICT, it employed three main qualitative research methods: 1) semi-structured interviews; 2) classroom observation; 3) document and literature analysis. While employing diverse methods can generally be regarded as good praxis in qualitative research, it does not per se guarantee the collection of useful data (Baxter and Eyles, 1997; Creswell, 2003; Morse, 2003).

The aforementioned research methods have been widely used in existing research which applied Actor-Network Theory (ANT) and Sociomaterial approach. For instance, semi-structured interviews and observation allows the researcher to identify the way in which a network forms and develops throughout assemblage processes. (Tatnall and Burhess, 2002). In addition, relevant document and literature were analysed to understand a similar context examined by the same theoretical approach to investigate ICT and education. To gain a better understanding, the following sections will describe the research instruments used to collect the data which I have used to address the research questions.

4.2.1. Semi-structured interviews

As the term indicates, a semi-structured interview has less rigid structure compared with a structured one. Hence, it allows the researcher to find unforeseen findings, which would have otherwise remained hidden if a fixed-structure interview had been carried out (Cochrane and Costolanski, 2013). At the same time, with a semi-structured format the researcher has to prepare well, otherwise the result of the interview could be disappointing (Hannabuss, 1996). For instance, the design of the interview should be decided before embarking on the interview, based on whom to interview and how to interview them (Doyle, 2004).

The use of open-ended questions within a semi-structured interview made the interview more flexible because I was able to ask additional questions when informants seemed to be able and willing to provide more information (Kvale and Brinkmann, 2009; Norton, 2009; Rowley, 2012). Therefore, some questions could be either added or omitted depending on the information given by the interview participants (Norton, 2009; Rowley, 2012; Bryman, 2016). Qu and Dumay (2011) emphasised:

> Most importantly, it (semi-structured interview) enables interviewees to provide responses in their own terms and in the way that they think and use language (p.246).

Semi-structured interviews are one of my main research methods, which I employed to allow teachers to share their beliefs regarding ICT and how that influenced their ICT practices offering both depth and flexibility (Budiman et al., 2018). The interview concentrated on the individual teachers' beliefs that were socially constructed from teacher training to the actual teaching profession. In addition, the research also stressed the contribution of materiality to teachers' beliefs and practices towards ICT, so questions included their general and pedagogical ICT experience. From ANT and Sociomaterial perspectives, pedagogy was also understood as 'uncertain and heterogeneous assemblages' when teachers connected with ICT materials (Fenwick and Landri, 2012:5). As a result, understanding general and pedagogical beliefs in ICT could be a clue to teachers' ICT practices. To minimise teachers' own subjectivities, vice-principals and ICT teachers were asked to reflect on how they viewed their teachers' ICT beliefs and practices. The semi-structured interviews with stakeholders (see 4.5.2) were also crucial to identify signals that dissolve the network of teacher and ICT. The interviews would clarify why those signals were interpreted as potential (human and nonhuman) actors that led to the network failure.

Due to language issues, an interpreter assisted me with conducting interviews when interviewees were not able to communicate in English. Although I learned a basic level of Amharic, it was difficult to lead interviews without having an interpreter. For participants who preferred not to speak in English, the consent form and verbal explanation of research were also translated by the interpreter. Signature was requested on the form, and teachers were not reluctant because school principals had already explained my affiliation to IER and MOE. All interviews were recorded because of limitations with note-taking and transcribed verbatim for analysis. Transcription was a significant part of my research, as is typically the case in qualitative analysis of interview data (Oliver et al., 2005; Widodo, 2014).

4.2.2. Document analysis

It is a qualitative research method that systematically reviews and interprets the document both printed and electronic (Bowen, 2009). Through document analysis, the researcher can gain a better understanding of research contexts and find explicit and implicit meaning related to his/her research topic (Corbin and Strauss, 2008). The document herein indicates:

> Advertisements; agendas, attendance registers, and minutes of meetings; manuals; background papers; books and brochures; diaries and journals; event programs (i.e., printed outlines); letters and memoranda; maps and charts; newspapers (clippings/articles); press releases; program proposals, application forms, and summaries; radio and television program scripts; organizational or institutional reports; survey data; and various public records (Bowen, 2009:27).

Document analysis is also often used as a means of triangulation through combination with other qualitative research methods (interviews and observation) to collect robust data on the same phenomenon (Denzin, 1970; Bowen, 2009). It is useful because document analysis can provide background knowledge, which helps to contextualise other research data (Bowen, 2009). By converging different data collected by different methods, as a result, the research can build its credibility (Eisner, 1991).

However, due to a deluge of information, it is crucial to keep in mind that documents are not always useful. We should consider not only the quality of document but also potential biases from either researcher or document. In this respect, both investigation and evaluation skills are required to differentiate and judge what to take and what to not take from the documents (Bowen, 2009; O'Leary, 2014).

In this research, document analysis was a helpful method in order to discover Ethiopian teachers' beliefs in ICT and their ICT practices in teaching. Angers and Machtmes (2015) also investigated technology-integrated beliefs and practices of middle school teachers via employing document analysis as a research method and triangulated document with data collected from interviews and observation. In addition, document analysis enabled me to track the change and development of Ethiopian ICT and education policies and teacher training. The investigation of documents published by (inter)national organisations helped me to identify the influence of organisation on ICT and education and decide who to interview for further information that could not be found inside of the documents. These triangulation methods helped me increase the credibility of my data and research.

4.2.3. Classroom observation

As well as conducting semi-structured interviews, classroom observation enabled this research to find data which could not manifests itself verbally. Although observational research produces important tacit knowledge and findings, there have been criticism of classroom observation because the findings from the observation could not explain why things occur and there is no clear theoretical engagement (Waxman et al., 2004). I specifically observed the classroom (teachers' doing and saying) based on Sociomaterial approach and ANT perspectives to understand the assemblage between ICT and teachers because there were series of non-human and hidden factors that constructed teachers' ICT practices and beliefs in ICT. Above all, other ANT and Sociomaterial research also frequently employed observation as a major research method to collect the data (Bolldén, 2015; Budiman et al., 2018).

In particular, the second question investigated the influence of materiality to teachers that could only be brought to light via classroom observation. Above all, the observation was able to discover teachers' ICT practices when teachers and ICT materials were connected. Although teachers themselves could explain how they utilised ICT for their teaching, taking an objective view of the actual ICT practices by the researcher would deduce the actual condition of ICT integration into the classroom.

When I observed the classroom, I adopted an overt role which only focused on researcher's role without participating in order not to disturb the natural flow of the teaching (Bryman, 2016). What the observation focused on was teachers' doing and saying in relation to ICT practices. In addition, classroom as a venue and ICT-related instruments were observed to find how they initiated and changed teachers' teaching practices when they were connected. In contrast with the semi-structured interviews, this method provides a different type of reliable data because data is collected in more opened and natural way.

Although semi-structured interviews are an important data collection method for this research (particularly teachers' beliefs in ICT), classroom observation was also crucial to find data especially with regard to practices. Practices will not be found through semi-structured interview because (1) verbal communication may limit the data and (2) our judgement is determined by what we see rather than what we hear (Kawulich, 2005;

Newby, 2014). That was why Mol (2002) argued the observation should be conducted when practices are studied.

> The ethnographic study of practices does not search for knowledge in subjects who have it in their minds and may talk about it. Instead, it locates knowledge primarily in activities, events, buildings, instruments, procedures, and so on (p.32)

The dynamic inside of the classroom, particularly the relationship between teachers and students during the lesson may represent more than interviews. In addition, only researcher with objective perspective could differentiate and identify how presence of materiality or malfunction of ICT (related) material would unconsciously construct teachers' beliefs. This was because teachers who were inside of the network would not acknowledge their rationales of not using ICT.

Apart from above three methods, I took effective fieldnotes while I observed the classroom based on guide list by Spradley as follows:

1. Space: the physical place or places
2. Actor: the people involved
3. Activity: a set of related acts people do
4. Object: the physical things that are present
5. Act: Single actions that people do
6. Event: a set of related activities that people carry out
7. Time: the sequencing that takes place over time
8. Goal: the things people are trying to accomplish
9. Feeling: the emotions felt and expressed (Spradely, 1980:78).

During the observation, I initially took jotted notes on my small notepad and a number of photographs were taken in every classroom. These turned into full field notes because both jotted notes and photographs recalled the spaces and activities that took place in the classroom (Bryman, 2016). However, taking out the notepad could sometimes distract the moment from participants' natural behaviours. Any missing moments were supplemented by recording files that I always turned on during semi-structured interviews.

4.3. Data analysis procedures and themes

Data analysis is a critical stage because this is the stage when collected data turns into meaningful information. This meaningful information could represent how the research interprets the context based on a certain theoretical perspective. In the case of this research, it employed ANT and Sociomaterial approach which diagnose the Ethiopian teachers' beliefs in ICT and their ICT practices in the classroom. The symmetrical perspective of ANT and sociomateriality makes the data analysis concentrate on how teachers and materials influence each other and determine the solidity of network between teachers and ICT.

As mentioned, this research primarily applied three research instruments: 1) semi-structured interviews; 2) classroom observation; 3) document analysis to collect data. The following paragraphs summarise the research analyses of data collected by the three methods.

In general, data analysis of qualitative research is done via iterative process (Creswell, 2003; Denzin and Lincoln. 2003). Merriam (1998) said:

> (iterative process) involves moving back and forth between concrete bits of data and abstract concepts, between inducive and deductive reasoning, between description and interpretation (p.178)

During this process, researchers repeatedly revisit the data collected in interviews, observations, and documents in order to drag out meanings, patterns, concepts and themes (Punch, 2009; Srivastava and Hopwood, 2009; Cohen et al., 2011). This meaning-making is possible because qualitative iterative analysis is:

> a loop-like pattern of multiple rounds of revisiting the data as additional questions emerge, new connections are unearthed, and more complex formulations develop along with a deepening understanding of the material (Berkowitz, 1997:2).

In this research, iterative analysis was also employed in order to understand Ethiopian secondary school teachers' beliefs and practices in relation to ICT. In particular, it examines the construction of both beliefs and practices so that the research was conducted from teacher training institutes (chapter 5) to secondary schools (chapter 6). Moreover, to diagnose the present circumstances, the analysis investigated the reflections from stakeholders heavily engaged in Ethiopian ICT and education (chapter 7). The analysis started with inductive coding that sought to find repeated patterns and meanings from participants' responses. For instance, interview data was coded based on similar categories and compared with the observation data and published document during and after data collection. This inductive coding became clearer and more tidier via this triangulation process with comparing observation and document analysis. It ensured the quality of data and enhanced the quality of analysis.

The themes were derived from data analysed via iterative process and concluded with two different themes in each empirical chapter (5,6, and 7). The themes of chapter 5 were pedagogy and materiality. As discussed above, pedagogy would become uncertain when teachers connect with ICT in Sociomateriality and ANT perspective (Fenwick and Landri, 2012). This pedagogical uncertainty was captured in the semi-structured interviews with educators and trainees, as well as in classroom observation in teacher training institutes. Subsequently, the influence of materials on educators' pedagogy and trainees' learning environment was also explored to identify the factors that either prevent or enable teachers' ICT implementation.

Chapter 6 focuses on themes of beliefs and materiality, and discusses not only ostensible factors but also hidden factors that affect teachers' beliefs and thoughts throughout their lives and teaching professions. In light of the perspective of Sociomateriality and ANT, it stresses the impact of materials in secondary schools and how these determined teachers' beliefs and practices about the use of ICT. Above all, the interview data was categorised into two different beliefs (general and pedagogical) along with document analysis containing a strong relationship between teachers' beliefs and ICT practices. In addition, the idea of TPACK made this research pay attention to the importance of technological pedagogical knowledge.

Chapter 7 diagnosed the current on-going situation with two themes: 1) signals and 2) interpretation. Above all, signals were found primarily via semi-structured interviews and classroom observation and I asked stakeholders how my findings could be interpreted from their own perspectives.

4.4. The state of emergency and finding affiliation

4.4.1. State of emergency

Living in a country with a declared the state of emergency was a unique experience not only as a researcher but also as a person. When I was planning the fieldwork (started in November 2016), the situation in Ethiopia was politically unstable and people were about to explode into anti-government demonstration (Reuters, 2016). Since November, 2015, there have been several protests in the Oromia region. Protesters have been complaining about political repression and unfair economic development (Economist, 2016). Demonstrations have since then sprung up in Amhara region (BBC, 2016b). According to Amnesty International, almost 100 people were killed during the weekend from 5th to 7th August, 2016 in both regions (BBC, 2016a).

From the Ethiopian government's perspective, however, those protests would all be considered as terrorist acts based on its law called Proclamation on Anti-Terrorism which was passed in August, 2009. Under the law, the government and security forces have quelled the demonstrators but the process of suppression has been embroiled in controversy. Although there is no clear universal definition of terrorism, peaceful dissent can also be regarded as terrorist acts under Ethiopian law (Gordon et al., 2015). For instance, if protesters blocked traffic but without any violence involvement, this can still be understood as terrorist acts because of the inclusion of the phase 'disruption of public services' (FNG, 2009:4830; Gordon et al., 2015). Further, public services indicate 'electronic, information communication, transport, finance, public utility, infrastructure or other similar institutions or systems' (FNG, 2009:4828). Consequently, that is one of the reasons why the Ethiopian government monitors and censors the contents of the Internet as well as personal SNS accounts (Freedom House, 2015). For example, the government arrested and sentenced a number of journalists, bloggers and democracy activists who took an opposite stance and publicised their political dissent (ibid).

In relation to this, the more recent law called Telecom Fraud Proclamation, which came into effect from September 2012, complements the anti-terrorism law (CIPESA, 2014). It labeled telecom fraud as a threat to national security. Under these two laws, the government has filtered and blocked Internet websites which contains any content criticising the current government. In 2014, six bloggers and three journalists were arrested by the government because the government felt that they would destabilise the country through social media (ibid). However, according to Human Rights Watch, the government's surveillance and censorship would reflect a ruling which hinders Ethiopian people's technological ability to communicate and share their opinions including political dissent (Human Rights Watch, 2014). Criticisms argue that the government violates the right of thought, opinion and expression (Gordon et al., 2015; Sekyere and Asare, 2016). This context shows why the government has been sensitive to any potential activities against the government.

4.4.2. Finding an affiliation

4.4.2.1. Unsuccessful replies

Selecting and being affiliated to an appropriate research partner was key to collect appropriate data and achieve the objectives of this thesis. Conducting the research in the Ethiopian context was the first time for me, so that it was important to have an affiliation to a certain organisation that already engaged with ICT-related research. However, I did not want to be affiliated to either developed countries' research tanks or aid agencies because I recognised it would be important to directly listen to Ethiopian voices, rather than having others' biased perspectives or being seen as connected to foreign organisations. Due to this filtering process, the list of choices was already limited because it was hard to fulfil both of my research topics: education and ICT.

I found three possible organisations that could host my fieldwork research. The first one was Addis Ababa-based economic research institute (anonymous) which was introduced by a professor at the University of East Anglia. I contacted the organisation but received a distressful answer. The answer was that the Ethiopian government forced the institute to close because of anti-government research publication.

The second organisation was the Ethiopian Development Research Institute (henceforth EDRI). EDRI is also an Addis Ababa-based think-tank that bridges between research and policy implementation. Although its major focus was on economic research, it covered the field of education as well. However, the researcher who I contacted said that there was no ongoing research with respect of ICT and education.

4.4.2.2. Successful reply from the Addis Ababa University

After contacting two organisations, it seemed to be difficult to find an affiliation to any research institute. The third organisation was the Institute of Educational Research (henceforth IER) at the Addis Ababa University; I emailed a specific professor who published a Journal article that I read. In the email, I briefly introduced my research and time frame in Ethiopia. The professor was interested in my research and asked me to share my research proposal. Since sharing the research proposal, the process of affiliation proceeded smoothly, including smooth Ethiopian Visa administration. After a couple of weeks, the IER asked me to send a letter written by the head of School (International Development) of my institution. As a result, the institute officially invited me as a graduate researcher. In addition, the professor asked the MOE to allow me as an external research team member of their research project.

Although the IER at Addis Ababa University was the only institution which responded positively to my request, there were two major reasons why I was very satisfied and which actually convinced me that this was the best outcome for me. First, the professor, whom I mainly worked with, had the same research interests in relation to ICT-integrated education. As mentioned, he published several books and journal articles that discussed ICT implementation in secondary schools and teacher education. In addition, he considered that my involvement could develop a scope of ongoing research in IER because I looked into teachers' beliefs and the reflection of international organisations on Ethiopian ICT and education which were not in IER's concerns.

Secondly, IER was able to provide me with a wider experience not only in research but also in cultural understanding. When it comes to research, IER kindly offered me to join a research team collaborated with MOE. Having research experience with MOE helped me to understand the primary objectives and future direction of Ethiopian government. Above all, I was able to get an easier access to other government bodies and selected schools, which helped me to conduct my research. This was only possible because IER and MOE could guarantee my status as a researcher. For instance, when I visited Kotebe Metropolitan University as an individual researcher[10] without notifying them that I was affiliated to IER, I was not welcomed. However, once they realised that I belonged to IER they became more cooperative. Under this bureaucratic system, if I had not found affiliation, I could not have carried out my data collection.

In regard to the cultural aspect, this allowed me to easily be exposed to the culture of Ethiopian society as a *hybrid* insider, another advantage of being affiliated to local organisation. The reason why I described myself as hybrid insider was that I was welcomed anywhere because my colleagues always took me with him. However, at the same time, I instantly became outsider when they started to communicate in Amharic. I was rather comfortable with this situation when I could closely observe the atmosphere and behaviour that naturally revealed. This was the time when I took research notes and asked questions that I was curious about. As a result, I was able to capture some specific moments (Gerontocracy and religious customs) which could impact on teacher education and their ICT-integrated practices (see chapter 5 and 6).

[10]It took almost a month to settle down all administrative jobs including IER researcher ID card. This was why I could not represent myself as affiliated researcher when I tried to visit the research site to apply for a research permit. Both universities and secondary schools asked me to bring a support letter from IER or AAU if I would like to conduct the research.

4.4.2.3. Difficulties caused by IER affiliation

Being affiliated to IER, however, was not always beneficial – for example when I faced a discord with the related body, MOE, in terms of schedule and attitude to research. The initial plan of classroom observation was observing two different classes in each school but eventually I was only able to do one from Addis Keteme and none from Yekatit 12 (see chapter 6). This was because MOE staff were frequently absent and late without notice. I did not have any problem with other two MOE staff who were always punctual when we visited the four other schools. If I had been able to visit schools on my own, I could have completed the classroom observation. The objective of MOE staff assigned by IER professor was to support me particularly when I occasionally should manage an interview in Amharic. However, his untrustworthy behaviour was found in data collection which made research team working difficult. When I reported his absence to IER professor, he told me that he would visit Yekatit 12 (he used to work for Yekatit 12 as an English teacher) on his own to complete the classroom observation and additional interviews. What he submitted to IER professor was the transcribed data from two schools they were exactly identical. No one had recognised this in the research team before I pointed out. The team leader of MOE and AAU asked him to double-check but he kept denying what he did. Fortunately, I had recording files which helped us re-transcribe for Addis Keteme and Yekatit 12. The reason for indicating this event is that I am not the only one who works together with local staff during research periods and has to navigate teams who are either late or irresponsible. Therefore, I found it important to manage the overall research schedule as well as collected data.

4.5. Rationale of sample selection

The four most widely used sampling techniques used for qualitative research are: convenience sampling; purposive sampling; snowballing; quota sampling (Creswell, 2003; Taherdoost, 2016). In comparison to quantitative study, qualitative study uses smaller sample size that helps to 'reflect the diversity within a given population' (Barbour, 2001:1115). In addition, smaller samples allow researchers to investigate a real life phenomenon in greater depth (Yin, 2003). Although statistical inferences with a wider sample would have strengths such as greater external validity and the identification of large scale patterns, this could not fully explain a real life phenomenon that requires longer time of data collection and deeper analysis (Fraenkel and Wallen, 2006).

The objective of this research is to understand how Ethiopian teachers' beliefs and practices about the use of ICT in their teaching practices are constructed. As generalisability is likely a limitation on this research, deeper understanding of teachers' beliefs and practices about the use of ICT could contribute to policy design and implementation in similar contexts and schools.

4.5.1. Selection of universities, private centres, and schools

I was able to select both universities (teacher training institutes) and private training centres. In the case of universities, there were only two universities in Addis Ababa that provided PGDT programme. The only difference between them was that Addis Ababa University (AAU) was providing the regular PGDT while Kotebe Metropolitan University (KMU) was providing summer PGDT. The different type of PGDT meant having different trainees. For instance, AAU trainees would be young university graduates without teaching experience whereas KMU trainees could have relatively longer experience than AAU trainees in teaching. Having different types of trainees was interesting as it could add diversity to the interview data.

With regard to private training centres, these were not part of my research interests at the initial planning stage. However, when some of the interviewees mentioned that their experience in private centres was superior to universities, in terms of pedagogy and ICT materials (see chapter 5), I felt it would have been useful to pay attention to the role of private centres in teachers' beliefs and ICT practices. This decision was made at the end of my fieldwork so that I had to strategically think how to conduct the research into the contribution of private centres. Therefore, I simply visited some private centres which advertised on either lamp posts or windows of mini buses. Interestingly, every centre asked me to provide an official letter that could prove my identity and affiliation to a certain institution. In this situation, having an affiliation to local (and well-known) institutes was very helpful for me to receive the research permission. Although I am a postgraduate researcher at UEA, Ethiopian institutes (not only private centres but also universities) would prefer to open their doors to organisations with which they were familiar. For example, one private centre clearly stated that they would only provide their information to local organisations. Simply speaking, I would have not been able to conduct my research without IER affiliation. After several visits, I successfully received the permission from two private centres.

IER affiliation certainly had an advantage in relation to the acquisition of access to universities and private centres. However, the process of secondary school selection was different because the schools were already selected by IER and MOE before I joined the research team. The scope of the research conducted by IER covered the entire regions of Ethiopia so that only a few schools could be selected. The top priority of selected schools was a completion of the digitisation process that was planned in GEQIP II[11] because both MOE and IER would like to see how installed ICT materials were in use (see chapter 2). There were more digitised schools particularly in Addis Ababa because Addis Ababa Education Bureau had more budget for extending school digitisation, which were not selected by GEQIP II. There were 65 digitised schools in total and six of them were selected. While this was not formally acknowledged, some schools have been likely selected due to preferential relationships with the research centres, or their long history, social reputation, and even political alignment (pro-government). Nonetheless, I am confident that these selections have had a negligible influence on the results of my research because ICT materials and teachers of these schools were not substantially different to those of the unselected schools.

4.5.2. Selection of (inter)national organisation, aid agencies, and Chinese companies

Throughout the ESDP and GEQIP, it was easy to identify the organisations involved in Ethiopian ICT and education. Although the Ethiopian government took the lead, there were many other public and private organisations that showed their activeness in the field of ICT and education. In addition to policy document, IER colleagues informed and recommended to me to contact some of organisations that would be helpful to understand the reality of this field.

When it comes to national organisations, I selected two organisations as follows. Firstly, the Centre for Educational ICT (henceforth CEICT) was the principal organisation that was in charge of ICT-integrated teaching across the country. The second one was the Ministry of Communication and Information Technology (henceforth MCIT), that managed the overall ICT-related policies including capacity building, e-government, private sector development. With regard to international organisations and donor agencies, GEQIP was helpful because its funds were pooled by many organisations taking the lead of the World Bank. Alongside of World Bank, USAID and DFID were selected as two major donor agencies in Ethiopia. Although UNESCO-IICBA and KOICA (Korean aid

[11]300 schools were piloted to be digitised by two computer labs with 80 computers and establishing Internet connection.

agency) were not engaged with GEQIP, they were selected as active organisations in the field of ICT and education.

Lastly, while I conducted the research I realised that the contribution of Chinese companies to Ethiopian ICT and education was noteworthy. Above all, Zhong Xing Telecommunication Equipment (henceforth ZTE) heavily engaged with Plasma TV instruction and the entire ICT materials for GEQIP II school digitisation were manufactured by Huawei. Although there were other new Chinese companies actively working with the Ethiopian government, these two could explain the development trajectory of Ethiopian ICT and education.

4.5.3. Selection of interviewees

In total, 74 interviewees participated in interviews throughout this research. They were fully aware of the purpose of my research and were happy to provide information. I preferred to conduct the interview by myself because I could go deeper when I found something interesting in a direct way without 'intermediaries'. However, since some teachers in secondary schools were not familiar with English, I was accompanied by an interpreter[12] whenever I visited secondary schools. To explain the research objectives, I had a meeting with the interpreter to provide the interpreter an opportunity to clarify what I (researcher) would like to extract from interviewees.

On top of the aforementioned 74 participants, there were 30 secondary school students who took part in the focus group discussion. Although they were not in my initial research plan, their insights on teachers' beliefs and ICT practices was certainly a valuable addition to teachers' reflections. I asked the IER professor to use the data from 30 students and he approved.

The selection of officials in the organisation was rather simple because each organisation had a person in charge of education. Furthermore, ICT-integrated teaching and learning was one of government's top priorities so that education specialists did have an idea in relation to ICT in education.

[12]IER professor looked for someone who had adequate academic interview experience and introduced one professor (doing his Ph.D in AAU and working for Ambo University) as a reliable interpreter. He always came to six selected schools with me when I conducted interview because I gave interviewees an option of using either English or Amharic for the interview.

4.5.3.1. Universities and private training centres

Since I was officially affiliated to IER and connected to KMU, finding educators in both teacher training institutes was simple. However, finding trainees were not as simple as educators. In this regard, I asked AAU and KMU educators to allow me to introduce my research after classroom observation. After classroom observation was crucial because trainees did not know that I observed the class so that they could behave as usual – although it has to be expected that my presence in the classroom did not go unnoticed and may have generated suspicion. For the regular PGDT in AAU and summer PGDT in KMU trainees, 10 trainees volunteered to take part in the interview. However, regular PGDT trainees introduced five summer PGDT trainees in AAU because my interviews started after they completed the PGDT course.

When it comes to private centres, there was one general director and this was the obvious candidate for the interview as this was the only person who could provide me information. It would have been better to conduct some interviews with trainees from private centres but no trainee would like to be interviewed. This was understandable because most of them spent their spare-time studying ICT either before or after work, which made them very busy. Nevertheless, the two directors provided a fairly large amount of information, with which I was satisfied.

4.5.3.2. Secondary schools

As a research team member of IER and MOE, I was in charge of collecting data from six schools in Addis Ababa region. I visited each of the six schools whereas three different MOE staff were assigned to only two of the six schools. In each school I distributed 20 questionnaires and conducted semi-structured interviews (with vice-principal and ICT teachers) and focus group discussion (with students). To manage the process smoothly, IER already contacted the school principal in each school, who acted as a coordinator, gathered together interviewees on our visiting day (vice-principal and ICT teachers) and helped with the distribution of the questionnaires to 20 teachers.

Although the IER research and my research had many commonalities, the IER questionnaire to teachers did not include the question regarding their beliefs in ICT, which was my primary concern. Hence, I asked every school principal to collect five teachers, who filled in the questionnaire, for in-depth interviews when I would visit the next time. I did not know the exact criteria followed by the principals in the selection of the five teachers, but I expect that most principals were interested in selecting highly capable and highly qualified teachers – also due to feeling in competition with other schools. For example, when principals introduced teachers to me, they proudly told me about their qualification and English proficiency. In any case, for each of these specific interviews, I was accompanied by the interpreter in order not to risk losing interviewees due to English proficiency. Every translation from the interpreter was double-checked by the IER professor with the recording files.

Lastly, for the focus group discussion, principals helped to collect students. The discussion was conducted in Amharic, led by MOE staff and then translated for me. As mentioned earlier, however, their opinions on teachers' ICT practices was highly valuable in providing information on what happened in the classroom.

4.5.3.3. (Inter)national organisation, aid agencies, and Chinese companies

As mentioned above, the interviewee for these organisations coincided with the person in charge of external communications. Scheduling interviews was often challenging, particularly in the case of Ethiopian government officials and Chinese companies officers because they were extremely busy. For instance, the IER professor and colleagues waited for CEICT director to interview more than a month. However, they could not meet him due to his busy schedule. I also waited almost three months for him to conduct an interview. Nonetheless, three months of time was worthwhile because he was the highest official in Ethiopia in relation to ICT and education.

In this regard, I was always prepared to visit any officials at any time when they informed me 'I could do today'. In MCIT, three directors were interviewed: 1) capacity building; 2) e-government; 3) private sector development coordination. This was only applicable to the case of Ethiopian officials and Chinese officers. For instance, when I visited MCIT and completed the interview with e-government director, I accidently met a secretary of private sector development coordination director in front of the office. I tried to make an appointment via phone but she said the director was in the meeting. She told me that the director was in his office so I could make an appointment with the director on the next day. If I did not meet the secretary on that day, I would not have been able to interview the private sector director. On top of these two directors, I also interviewed the capacity building director. Although three directors were not directly linked to education, they could provide context on the national approach to ICT integration into Ethiopian society, which would have connection with education.

As mentioned above, the World Bank, USAID, and DFID were heavily engaged in GEQIP as pooled fund partners. In addition, they also had education specialists who could share their own ideas in relation to ICT and education. In the case of World Bank, there were the senior education specialist and the senior economist who were in charge of GEQIP as team leaders. I contacted them via email and conducted two separate interviews. Similarly, I contacted USAID and DFID via telephone and made appointments to conduct the interview with the education specialist. Although UNESCO did not participate in the GEQIP, the IER professor introduced me to the UNESCO programme officer for ICT in education. The programme officer had a long experience in ICT-integrated education, not only in Ethiopia but also across many African countries. The Korean aid agency was also not in GEQIP pooled-fund, but the Korean government built an ICT room in Adama University and made this a science and technology specialised university. Moreover, there was an ICT and education advisor in CEICT dispatched from Korean government. The advisor could share what he had seen and experienced over two years in CEICT.

Obtaining interviews from the Chinese companies was particularly challenging – in terms of both approaching them and scheduling an appointment. Meeting national government officials was also difficult but my MOE and IER affiliation were helpful when I contacted them. However, from the Chinese companies' perspective, there was no rationale to meet me and provide me with any information. Thus, I decided to simply spend time and wait because of the value this information would have had for my research – given the important and ever growing role played by Chinese companies' in Ethiopian ICT. To interview the ZTE officer, I frequently visited the café located downstairs of ZTE Addis Ababa office for about five months. In the end, I was able to meet the person in charge of Plasma TV project. In the case of Huawei, Huawei building had security guards so that I was not able to take the same approach as ZTE. Disappointingly, ZTE and Huawei were rival companies so that ZTE officer could not introduce anyone in Huawei. In fact, ZTE did not allow their employees to meet or have a conversation with Huawei employees and vice versa. That was why I kept emailing and calling Huawei to conduct the interview. Finally, I reached an education officer almost after 11 months of trials.

4.6. The positionality of researcher in the field

As mentioned, I collected primary data in Addis Ababa for 11 months and 9 months were under the state of emergency. Hence, although I would like to explore other regional cities to compare with Addis Ababa, the Ethiopian government highly prohibited all foreigners from travelling outside of the capital city. In spite of unstable circumstance, crucial ICT infrastructure such as electricity and the Internet access in Addis Ababa were relatively better than other regions so that I proceeded my research only in the capital of Ethiopia.

Nonetheless, data collection was challenging because universities, secondary schools, and even private training centres were cautious of providing foreign researcher with their information. Above all, the state of emergency could affect the wariness of these institutions that might cause unexpected problems due to research participation. That was why I positioned myself as a local researcher with my affiliation to the IER and the IER director wrote an official letter that assured my research purpose. Moreover, my presence (being the only Asian among Ethiopians) in the classroom might affect the behaviours of teachers and students but they became normal after a few minutes because I was always accompanied by colleagues.

Although I positioned myself as a local with my colleagues, the school selection could cause biased outcomes because some schools were likely to have close relationship with the government. However, six schools were geographically well scattered across the city so that could represent the average standard of schools. If I had selected secondary schools, the selection process would been taken much longer under the state of emergency. To prevent possible bias, I interviewed with international organisations and aid agencies that could cross-check how other schools implement ICT into education.

4.7. Reflection on the state of emergency

Under the government monitoring and restriction of the Internet, I had some meaningful conversations and observations that may help illustrate what this meant in practice for people, as well as the circumstances under which I carried out my fieldwork. The difficulty in accessing information, websites and applications due to government surveillance really weighed on people. For example, one day a librarian at CEICT asked me something which was very telling of the situation. I visited the centre several times not only for the interview with the director but also for the data collection, and she often helped me find some useful resources. Perhaps also due to a sense of trust which she developed towards me, the librarian came to me while I was waiting for the interview and said:

> Since September last year (she meant 2016), I could not use the Viber[13].
> Do you know how to use? Because I have seen somebody still using it
> and they said but with additional programme. [Field Notes. 08 March 2017]

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[13]Smart phone application for free voice calling (VoIP: Voice over IP) service via either Wi-Fi or mobile data.

Figure 4.1 Library in the CEICT

For me, it was the first time I experienced a government blockage of the access to the Internet. I was not able to help her. When I asked to my colleagues in the IER, they said that the Ethiopian government blocked access to Viber not only via mobile data but also via Wi-Fi Internet connection[14]. Thus, there was no alternative way unless she used the VPN (Visual Private Network) to detour around Ethiopian Internet Protocol address. Similarly, one educator in the private training centre (see chapter 5) told me with regard to the government restriction on Facebook:

> Some trainees would like to know how to use (access) Facebook. We
> teach the way of using VPN application before the Facebook.
> [Field Notes. 19 December 2017]

The VPN is an indispensable application if one wishes to use Facebook or Viber, and, when I asked him whether using VPN is legal or not he shyly said that it is illegal. I have also tried to use many VPN applications during my fieldwork, but they did not work well. Hence, I asked my colleagues to recommend me the best and well-known VPN in Ethiopia (see figure 4.2) and surprisingly almost everyone already used the VPN, not only for Facebook but also for WhatsApp.

[14] CEICT had its own Wi-Fi connection for staff.

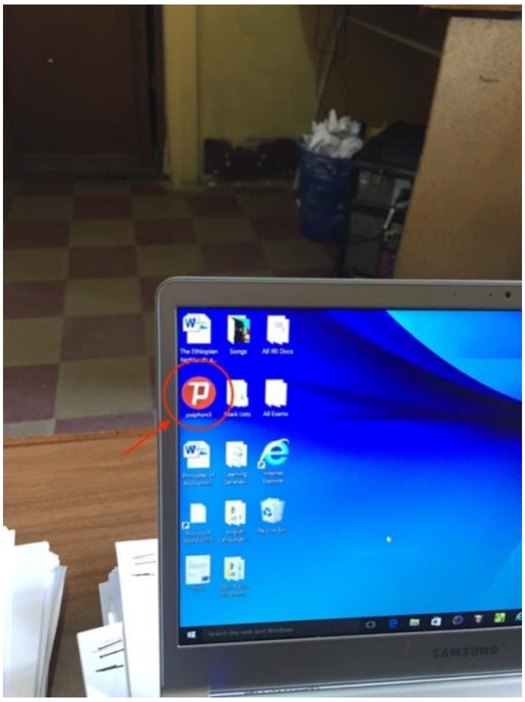

Figure 4.2 Most frequent used VPN in Ethiopia

It is also important to note that under the state of emergency the information gap was getting wider between the rich and the poor. In fact, issues such as the one above with VPN and the banning of specific websites and mobile applications affected disproportionally those who had the means to overcome these barriers and those who did not. While a large part of the population across the socioeconomic scale would have wanted to have access, only the most privileged could find ways to gain it. Before having my office in the IER, I did not have a place to work because of both frequent power outage and no Internet connection in the library. The following images are of the Internet café where I worked almost every day until I had my office (see figure 4.3).

Figure 4.3 Internet café in front of AAU main gate

It has not been easy to use the Internet in the university. This made me use the Internet at the Internet cafe next to AAU main gate. There was one gentleman who brought his laptop and used the Internet in a similar way as I did. The Internet cafe had a number of computers primarily for the Internet and word processing works. Price of using the Internet was 6 Birr (around 20pence) for 30 minutes which is equivalent to one way mini bus fare from my house to the AAU. I would imagine this is not cheap but affordable to most people in Addis Ababa. [Field Notes. 30 November 2016]

I sometimes came back to my house only because the Internet café could not get the signal for the Internet. Then, I went to the hotel near my house where I could use relatively stable Internet by paying 30 birrs for 30 minutes. Failure to connect to the Internet at the AAU Internet café happened frequently, so that I was often unable to visit any websites. Moreover, in that Internet café there was no socket which I could use to charge my laptop. After a couple of months, the IER provided me an office with the Internet connection and electricity (see figure 4.4). Since then, I could finally start to work properly and visit schools. This means that it took almost four months to settle and be able to work effectively. It should also be mentioned that, even then, most of international IP based website were not accessible or took a very long time to open.

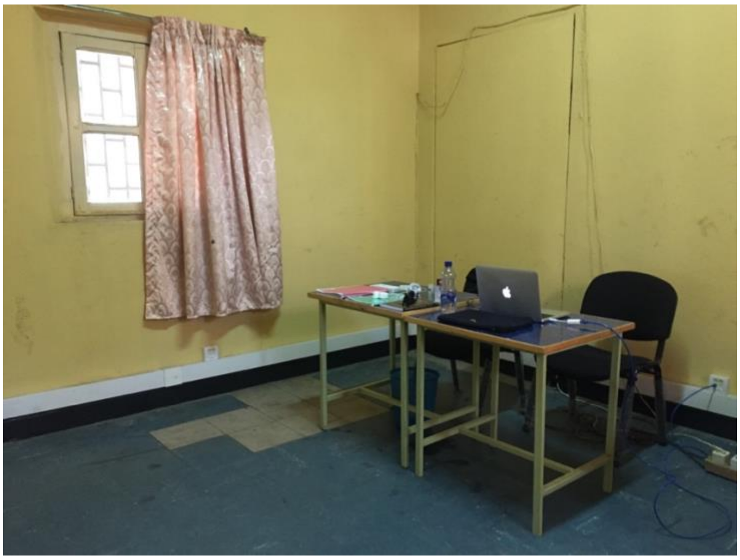

Figure 4.4 My office in the Institute of Educational Research

On the contrary, the Ethiopian IP address opened a lot faster. Here, the contents of Internet were filtered by the government. This made it difficult for me to find the relevant journal articles I needed while I conducted my fieldwork. An additional important challenge was the constant difficulty in accessing some Ethiopian government websites outside of the Ethiopia (for example from the UK). This led me to save the screenshot when I got back in December 2017 (see figure 4.5).

Figure 4.5 Screenshot of MCIT (accessed 8 December 2017)

A further important factor leading to a widening of the information gap was the cost of devices (smart phones or laptops) and phone cards[15] (scratch cards) (see figure 4.6). Every colleague from IER and MOE possessed both a smart phone and laptop for personal uses. Most Ethiopians did not believe the authenticity of smart phones and laptops distributed inside of Ethiopia (see chapter 6 section 6.4.2.1). To get authentic devices, they normally bought their phone and laptop from abroad when they had international conferences or business trips. If not, they asked their friends or even flight attendants[16] to purchase these devices for them. One of my colleague in MOE and my local friend in the gym also asked me to buy Samsung and Apple phones. In a similar vein, my colleagues used to buy either 50 birrs or 100 birrs phone cards – these were rather expensive cards and I rarely saw people on the streets purchasing cards of such amounts – but rather 5 birrs or 10 birrs cards. These phone cards represented for my colleagues additional access to information – because they were also able to use the Internet connection in the offices. Most of the public (including teachers), however, were only able to afford 5-10 birrs cards for access to information (see on this also chapter 6 section 6.5.1.2).

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[15]People need to buy a phone card to charge with either calling minutes or data plan. This can be purchased from the small street shop or hawker on the street. Most people buy either 10 or 20 birrs; it is sometimes it is difficult to buy a big amount (50 and 100 birrs).
[16]According to a Chinese business man, many Chinese flight attendants bought ICT devices from abroad which they then sold to local Ethiopians.

Figure 4.6 Ethiopian phone card (scratch card)

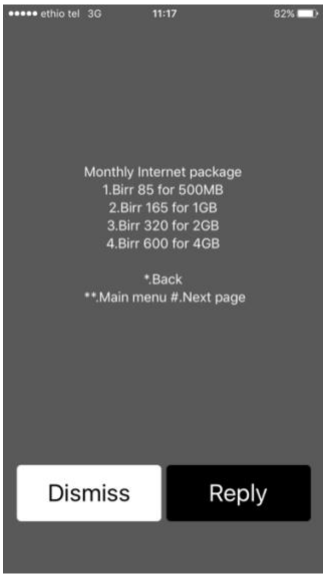


Figure 4.7 Screenshot of buying mobile data package

4.8. Conclusion

This chapter has presented how this research was conducted, from the initial stages of finding an affiliation to data analysis. Due to the state of emergency, the initial stage of the fieldwork did not go smoothly, but eventually I was satisfied with the data collection. Furthermore, my affiliation allowed me to live a more ‘local’ life, which led to more unique insider information. Chapters 5, 6 and 7 will attempt to identify how Ethiopian secondary school teachers’ beliefs and practices about the use of ICT are constructed. As mentioned above, three research instruments are employed to collect the data, and themes are analysed through Sociomateriality and ANT perspectives. Alongside these perspectives, theme of beliefs and TPACK are added to fill a gap between teachers and ICT materials which result in ICT implementation in teaching.

CHAPTER 5: Teacher Professional Development

5.1. Introduction

This chapter explores how Ethiopian teacher professional development institutes train their students in ICT implementation for teaching practices. Teachers are a fundamental element in bringing ICT practices into the classroom (Cuban, 1990; Schlager and Fusco, 2003; Lawless and Pellegrino, 2007; Almerich, et al., 2016) and teacher professional development, which influences teachers' beliefs and practices towards ICT (Kagan, 1992), has been stressed as an essential factor for encouraging proper ICT integration in teaching and learning (Yusuf, 2011). However, in general, most ICT teacher training around the world has concentrated, not on pedagogical knowledge with technology, but on basic technological skills such as keyboard typing and using a mouse (Kopcha, 2012). This tendency might make trainees hesitant to use ICT within their own teaching because they do not know how to use it for educational purposes. Some scholars even argue because content is not linked to day-to-day teaching practices, providing only basic technical skills might become a barrier for ICT integration in teaching and learning processes (Wells, 2007; Mouza, 2009).

Given the significance of teacher training in influencing teaching practice, Ethiopian teacher professional development associated with ICT needs to be investigated. As argued in the chapter 2, a number of educational policies initiated by the Ethiopian government anticipate a pedagogical usage of ICT. Especially, since the advent of TESO and ESDP III, the government has revised national teacher education and brought an evident plan for ICT implementation into every secondary school classroom. These policies were the first time the government clearly stated the need for ICT penetration into schools for educational purposes. The advent of ICT and education policies has extended the scope of ICT implementation and made ICT an indispensable element in Ethiopian education.

When it comes to ICT and teacher education research, it is often discussed that either material or teacher should come first because one is prerequisite for the other. However, this chapter will take these two – material and teacher – as symmetrical actors that embody ICT practices in the classroom (Sørensen, 2009; Fenwick et al., 2011). ICT practices herein mean a pedagogical usage of technology that takes into account both material and human factors which influence pedagogy, such as learning environment, materials and resources, teachers' capacity, willingness, and even belief.

In this chapter, I will explore three training contexts; 1) Addis Ababa University; 2)

Kotebe Metropolitan University; 3) Two private training centres. Within these contexts, key themes, I will investigate, are pedagogy and materiality (material settings). This relates to two research sub-questions 1 and 2 (discussed in chapter 1) and draws upon theories: ANT and Sociomateriality. I will explore these themes in relation to the three contexts and draw out some similarities and differences between universities and training centres.

The chapter will start with a brief explanation of two themes, pedagogy and materiality (section 5.2). These two fundamental themes support the following discussion that investigates ICT practices and material settings in the classroom. Section 5.3 will concisely depict the two universities and two private training centres where the data collection was carried out, to provide a process of establishing which characteristics and environments might affect teacher training itself. Section 5.4 will be divided into two sub-sections based on separate themes for both universities' PGDT InsT (Instructional Technology) module and private training centres. Section 5.5 will analyse findings in order to investigate the real facts of pedagogy and materiality which may not be found ostensibly.

5.2. Thematic framework

Understanding socio-material factors in relation to ICT practices is a useful approach to take because ICT usage in education is not as simple as asking teachers to use a technology inside of the classroom. To encourage ICT implementation, we need to consider personal confidence about ICT competency, learning experience, belief, leadership, learning community policies, and school culture and so forth (Akbulut, 2009; Plomp and Voogt, 2009; Thurlings et al., 2015; Bas et al., 2016; Van den Beemt and Diepstraten, 2016). In addition, the importance of physical (material) readiness must not be neglected. Thus, I will briefly introduce two major themes which help to shed light on the way of examining two institutes.

5.2.1. Pedagogy

With regard to ICT practices, pedagogy is emphasised as one of the most important aspects (Gil-Flores et al., 2017). Pedagogy cannot be taught individually to each teacher or uniformly implement; instead, teachers devise their own teaching strategies to achieve effective learning outcomes. With adequate pedagogy, teachers are able to provide up-to-date information to students and they are also able to manipulate ICT.

In a broad sense, pedagogy is defined as 'any conscious activity by one person designed to enhance learning in another (Watkins and Mortimore, 1999:17).' This activity is an interactive process between practitioner and learner and it also includes the learning environment. In particular, the learning environment herein does not only indicate the physical environment (tangible) but also denote actions in the environment (intangible) (Siraj-Blatchford et al., 2002). These intangible actions could be considered as indirect form of pedagogy. Moreover, political, social and cultural values of society are also influential elements to pedagogy (ibid).

Both tangible and intangible things have been interwoven and frame pedagogy so that teachers should consider for example content, learning environment, assessment, and even feedback to achieve the learning outcomes of teaching (Loveless, 2011). By considering these, teachers are able to end up constructing an appropriate pedagogy both for subjects and contexts.

When it comes to ICT implementation, pedagogical complexity is stressed well by the TPACK which focuses on the reason as to why teachers need to have a deep understanding of technology (Mishra and Koehler, 2006). TPACK argues that it is important, particularly when teachers decide in which ways to implement a technology, to deliver content knowledge using different pedagogical approaches (Glover et al., 2016). The way in which technology is used will determine the degree of students' learning outcomes (ibid). In other words, TPACK shows how the pedagogical design of technology use is important for teaching and learning processes. This association of pedagogy and technology leads to the importance of understanding materiality of learning in the classroom and it will be mainly discussed in this chapter.

5.2.2. Materiality

Classrooms are a communicative place for the interactive process related to teaching and learning (Roehl, 2012). However, because, in fact, materials shape the practices of human teaching and learning, the teaching and learning process is not only led by humans but also dependent on materials (Haas, 1996; Ellsworth, 2005; Roehl, 2012; Landri, 2013). For example, blackboard, chalks, desks and chairs, layout of the classroom, the classroom itself, and recently ICT, are materials which constitute education and affect educational practices. That is why the assemblage and dissolution of these materials are explored to understand the role of materiality in education, which results in practices which operate alongside interactions between teachers and students (Fenwick and Edwards, 2010).

In the same vein, the advent of ICT in the educational field has been a noteworthy phenomenon, which triggered the emergence of socio-material studies of education (Lawn and Grosvenor, 2005; Sørensen, 2009; Fenwick and Edwards, 2010). The socio-material approach deserves attention because ICT in education is ever increasing and its involvement in human life is indispensable (Landri, 2013). In addition, an investigation into the assemblage of human and non-human will help to find out the ICT practices inside of the classroom by taking symmetrical standpoint[17].

On the basis of these themes, the following sections will discuss in further detail ICT training in the Ethiopian context. Before moving on to the detailed thematic discussion, it will firstly depict two institutes, Addis Ababa University and Kotebe Metropolitan University and private training centres which have been selected as research sites.

5.3. Research site

As stated in the chapter 2, this research has been conducted only in Addis Ababa where two public universities provide teacher training. The major difference between these two universities is a type of PGDT course offered - a one-year long process to qualify trainees with a degree in teaching, and conditions of the learning environment. Given that differences might affect both process and outcome of the training course, findings will focus on both universities. In addition to the universities, the research turns its gaze on private training centres mentioned by a few interviewees. To compare and contrast training contexts this chapter investigates both pedagogy and materiality in the different institutions.

5.3.1. Addis Ababa University (AAU)

AAU was established in 1950 and it was the only institution that provided higher education in Ethiopia in the early 1950s. It initially offered courses in law and engineering with 33 enrolled students but expanded courses to the social sciences, offering fields such as History and Geography, in the late 1950s. Today, AAU provides 70 undergraduate and 293 postgraduate courses (221 Masters' and 72 PhD) with 48,673 students (33,940 undergraduates, 13,000 Masters' and 1,733 PhD students). The university has 10 colleges, four institutes, and six research institutes but herein the research is only conducted in the College of Education and Behavioural Studies.

[17]In taking a symmetrical standpoint one does not consider non-human as a supplement to serve human aims but grant a leading and independent role to non-human (Sørensen, 2009).

With regard to PGDT, the Ministry of Education accredits only 10 universities (including AAU) to provide regular PGDT course (Kassa and Amedemeskel, 2016). The College of Education and Behavioural Studies offers the course to prospective secondary school teachers who complete a three-year degree (content-based training). The PGDT regular course is a one-year long process to qualify trainees with a degree in teaching (pedagogy-based training) (World Bank, 2017). By implementing the PGDT, the government expects to produce a large number of well-equipped teachers and fill the gap between content and pedagogical knowledge of teachers (Abejehu, 2017). What is more, a teaching practice is seen as an essential component of teacher preparation (MOE, 2009; Gregory et al., 2011) to further reduce the gap between theoretical understanding and pedagogy.

In addition to the year-long PGDT, AAU also provides a summer PGDT course which is just for the current teachers, who did not complete the PGDT before starting work in their professions. For this summer course, trainees are not only coming from Addis Ababa but also coming from the other neighbouring regions, they can offer an understanding of the availability and functionality of ICT materials in other regions.

5.3.2. Kotebe Metropolitan University (KMU)

KMU was founded in 1959 and belonged to AAU (it was called the Haile Selassie I University). However, in 1969, it left AAU (at that time Haile Selassie I University) and came to known as Kotebe College of Teacher Education (KCTE, 2007). It was run by the Ministry of Education until 1996, when the responsibility of managing the college was transferred to the Addis Ababa City Administration. KMU used to provide degree programmes related to six areas of study in 1989 but from 2007 KMU extended to 10 different departments. On the basis of ceaseless efforts, KMU became a full-fledged Metropolitan University by the Addis Ababa City Administration in December 2016. Since then, KMU restructured its departments into eight; the College of Education and Behavioural Studies is the department on which this research will focus.

As given above, KMU is not included in the 10 universities, which can provide a regular PGDT programme. However, it is still possible to offer the summer PGDT course to the current secondary school teachers and it is well equipped to do so thanks to its established educational training programme for those who wish to become primary school teachers.

5.3.3. Private training centres

There are a number of private training centres in Addis Ababa and it is easy to find their advertisement posters and flyers across the city. In general, most centres are located on either the high street or around universities and they provide both computer and English courses. The training centre was not initially considered to be a part of the research but a few respondents mentioned their extra training in this unexpected place (private training centre). Although both time and money are required to undertake training, respondents said that there are many university computer science graduates and current secondary school teachers studying in a private training centre. As a result, the research explores two following centres to distinguish differences from PGDT in relation to pedagogy and materiality.

5.4. Findings

5.4.1. Pedagogy

As pedagogy is a mixture of interactive activities, this section explores both instructors and trainees' perspectives in order to examine the way in which trainees receive teacher training for their future ICT implementation. The observations and interviews were conducted between May and August 2017, Addis Ababa. In addition, interviews only focused on the PGDT InsT module in both universities.

5.4.1.1. AAU

In the AAU Instructional Technology Module (InsT), trainees learn both theory and practices in ICT education. The curriculum of the module contains knowledge content, which encompasses the definition of ICT and how and why teachers implement ICT in their teaching practices. This information is in the syllabus of InsT module, which is distributed to trainees via a textbook. Each student brings the syllabus to each lecture and an instructor trains them based on the content of the document. As introduced in chapter 2, policies related to ICT in education are reflected in both PGDT course and the syllabus, which aims at practical implementation.

An Observation of ICT Teaching Practice

I observed the class which was the week 2 of the InsT module. The lecture was a theoretical introduction, which explored reasons for ICT utilisation for quality education and a possible way of ICT utilisation inside of the classroom. This observation was crucial because it revealed hidden and unmentioned aspects of the actual ICT teaching practices in teacher professional development. After the observation, interviews were conducted with trainees who enrolled in the InsT module to compare what I observed in the classroom.

There were more than 30 trainees in the lecture theatre who had arrived on time. If I added up late comers, however, the size of the class reached almost 50. The size was too big to be managed by one instructor, despite that the instructor, who led the module, had almost 40 years of teaching experience on the topic. He was dressed in a white robe which connotes authority and responsibility over teaching and learning in the classroom. Likewise, this is why teachers can be found wearing a white robe also in both primary and secondary schools. When I asked the reason of wearing white robes, they said it is because of chalk; using chalk on the blackboard usually make their clothes dirty. Teachers think that unclean clothes would give a negative impression to their students. Nevertheless, some teachers, who do not use blackboard and chalk, still wear white robes while they are teaching. It has its own value that possesses the meaning of being a teacher and in a leading position, which might strengthen a teacher-centred pedagogy. Like this white robe, there are studies that examine how materials transmit and convey a hidden meaning (MacLeod et al., 2015). Hence, these materials with meaning could lead to particular practices that are acceptable and understandable in certain contexts. For instance, wearing a sari in India means an opposition to wearing Western style of dress (Miller, 2010). In the same vein, the value of this robe might also emphasise a relationship between lecturer and student which is relatively hierarchical. In this sense, teaching and learning process would be primarily led by an instructor who was in the white robe. Thus, training class was pedagogically hierarchical even though the instructor tried to engage with trainees. One of my colleagues (professor who invited me to AAU) in AAU who was youngest lecturer who taught in PGDT said:

> I am very kind to my students but they are often afraid of talking to me.
> [Field Notes. 6th July 2017]

Despite students feeling in awe of the lecturer, the lecture was frequently interrupted by trainees who came late. For example, students kept coming almost until the end of the first half of the lecture. For the first 10 trainees, the instructor said to each of them 'please submit your assignment before you sit.' After that, he did not talk about the assignment but started to talk about punctuality. He said 'being punctual is a basic etiquette and spending time on this lateness negatively affects to you not me'. While he was talking about punctuality, there were a few more trainees who waited for him to finish talking outside of the lecture theatre.

After the break, his teaching became more didactic in order to catch up the time that he had spent for punctuality talks. As a result, he could not cover that he was supposed to teach and he eventually skipped what he prepared with PowerPoint.

This didactic style of instruction took place in English as the medium of instruction. As a government plan, interactive process of learning activity in school should be done in English from secondary education (FDRGE, 1994). This is also true of teacher professional development because trainees are supposed to teach their subjects in English. The instructor, did not have any problems with teaching in English because he studied in the United Kingdom for his Masters' degree. However, trainees' English competency was not as good as the instructors so the lecture naturally fell into a unilateral mode of teaching, even if he taught with ICT via projecting the content on the wall.

Ironically, when instructor spoke in Amharic to explain some concepts, I was able to hear the noise of trainees that demonstrated an engagement in learning. When he spoke in Amharic, the lecture would become interactive because students could fully understand what the instructor said. This was not just happening in the front row of the auditorium-style seats but spreading to the whole lecture theatre. Some students started to laugh and talk to their neighbour even if the conversation might not relate to the topic. However, that increased interaction did not last long once instructor finished his explanation. When he returned to speaking in English an uneasy silence came over the classroom. Although a few trainees who sat in the front of the room continued to be involved in the lesson, the others became passive again.

I was sitting at the back of the auditorium in order to observe from the top. I only discussed my observation with the instructor so that trainees would not know that I was a researcher. For this reason, I was able to see the natural behaviours of trainees who sat nearby me. Two trainees, who sat in front of me, were using their mobile phones and scribbling down something on papers when the instructor started to teach. I realised that they were referring to the Internet to do their assignment, because this assignment was assessed they prioritised the assignment rather than the lecture. With this in mind, the resulting lack of engagement in the lecture cannot be understood wholly as a problem with the teaching taking place, but also the consequence of the assignment taking attention away from the instructor. However, given that assessment is itself an element of pedagogy to be considered by the teacher (Loveless, 2011), the teacher should consider how submission deadlines and the criteria of assessment might affect class engagement. At the end of the lecture, he made an announcement which would be considered as a little coercive pedagogical approach. He said:

> There are students who still do not open their email accounts yet.
> If you do not have one, you will not receive your readings and other
> learning materials. [Field Note 22nd May 2017]

It was his way to encourage trainees use computers in relation to their learning process. In addition, he even deducted five points from the assessment if trainees did not create an email account. This type of pedagogy required students to have email account but it did not mean that each trainee was then familiar with ICT itself simply by having the account. One interviewee said:

> When we (who already have an email account) get the material from the
> email we will give them (who do not have the email account) with flash
> and they can print…One day lecturer came to class and say you should
> have email account because you are a beginner now so if you do not
> have an email account, I will cut five marks from each of your grade…
> Some of us already have an email account and many of them did not
> have an email account and even they did not know how to create
> an email account. Most of them are from rural areas. So, we helped
> them to create with our phones (AAU R-PGDT[18], 27th July 2017).

The trainees from rural areas found it difficult to set up their email accounts, but did so with the help of others. However, having an email account does not necessarily guarantee that they are able to use their email to read materials.

Despite these challenges, the pedagogy of the lecture was not changed in order to accomplish the given learning objectives defined by the MOE. The instructor's pedagogy was standardised regardless of contextual characteristics and trainees' experience. Moreover, as the MOE decides to assign only two credit hours[19] to the module it is difficult

[18]R-PGDT: Regular PGDT
[19]One credit hour means having one hour class or lecture per week.

to finish all the content. This leads to the issue of insufficiency in relation to the credit hours which attempts to standardise the pedagogical approach. The insufficiency of the credit hours was frequently pointed out by interviewees. As an instructor said:

> It is only two credits too small. What can you do unless you simply just talk about it? With two credits course, if you asked your students to come and practices, they said ‘this is too much too much with credit of two’. (Interview, 18th April 2017)

Awarding the module only two credit hours infers that the module does not carry much importance. Hence, trainees are encouraged not to prioritise the InsT module compared to others that have longer credit hours. As a result, trainees do not spend much time on the InsT module and this leads them with inadequate knowledge of ICT.

> They have given the lecture about two credit hours so that means two days in a week. This is not enough for this. Also this course, one course is not enough for this. (However), they believe PGDT students (already) have much knowledge. They think that. For example, online registration. (AAU R-PGDT, 22nd May 2017)

Due to the short credit hours allocated to ICT training, instructors tend to fall back on a didactic teaching style to cover all the material required. However, the issue of insufficient credit hours also became an excuse for instructors to revert to an easier teaching style. For example, they admitted they preferred the current situation over making time consuming pedagogical changes which focused on vocational teaching that they cared less about. However, what trainees wanted was primarily actual ICT practices. One trainee said:

> There was no practice but learned basic skills full of theories. We took some hand out and theoretical but we do not know actual practice how even a single word is typed. So it was very difficult. Even I scored A in computer by memorising handout not by practices. So, it does not represent my knowledge. (AAU S-PGDT[20], 8th August 2017)

[20] S-PGDT: Summer PGDT

Ironically, the main objective of the InsT module is ICT implementation in education. As the role of ICT has been highlighted, the government has expected to see both educational quality and pedagogical improvement by bringing ICT into teacher professional development curriculum (MOE, 2010). This political interest has influenced instructors' pedagogical design, whereby they focus on completing all content without considering learning outcomes and effectiveness of PGDT course. Moreover, the instructor said that the current two credit hours was decided 15 to 20 years ago and remained unchanged. He said:

> I went to MOE because of meeting on the decision of credit hours.
> I tried to explain this (importance of credit hour) by giving them concrete
> example…for a student to be very good user of (ICT) materials the best
> means is…let them try and come up with their own conscious action…
> That is what we called as understanding. Words are meaningless.
> They said are you going to tell us that all discoveries are meaningless?
> useless? (I said) No. I am not saying that…It (discussion above) did damage
> credit hour. (Interview, 18th April 2017)

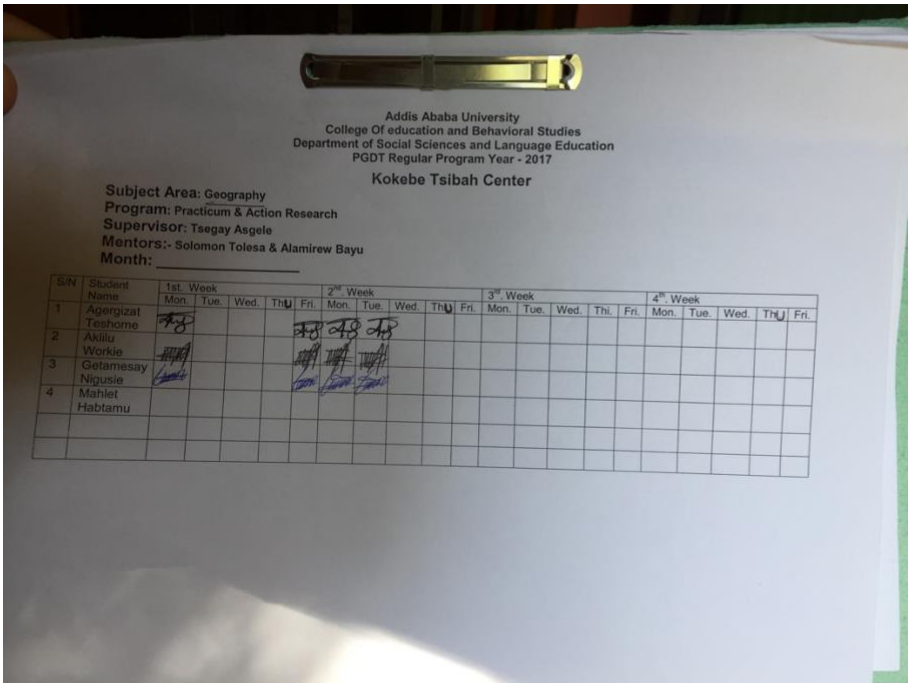
This insight shows that the government has not considered extending the time available for the InsT module for over a decade. According to the instructor, the attitude of government in relation to the objectives of ICT-related policies in education is paradoxical (see chapter 2). On the one hand, the government makes ICT implementation compulsory in secondary schools, through Plasma TV instruction and expects to see the potential of ICT in teaching and learning. On the other hand, it has not recently assessed the current credit hours, which have been in effect for over 20 years.

It is evident that pedagogy determines students' experience of learning (Hotam and Hadar, 2013). This experience can be described as learning outcomes which have the potential to influence their own pedagogical design in the future as teachers. To apply what they have learnt, students undertake four weeks of practicum. However, according to trainees in AAU, they could not properly complete their practicum due to a societal long standing custom[21]. One trainee recalled practicum as follows:

> It was a time of examination and holiday, Easter. Before the holiday,
> students would not come and after holiday students will not come.

[21]Not attending schools before and after Easter holidays.

I got only two days for my teaching. So, I did not use anything (ICT) (AAU R-PGDT, 27th July 2017).



Addis Ababa University
College Of education and Behavioral Studies
Department of Social Sciences and Language Education
PGDT Regular Program Year - 2017
Kokebe Tsibah Center

Subject Area: Geography
Program: Practicum & Action Research
Supervisor: Tsegay Asgele
Mentors:- Solomon Tolesa & Alamirew Bayu
Month: ____________

S/N	Student Name	1st. Week					2nd. Week					3rd. Week					4th. Week				
		Mon.	Tue.	Wed.	ThU	Fri.	Mon.	Tue.	Wed.	ThU	Fri.	Mon.	Tue.	Wed.	Thi.	Fri.	Mon.	Tue.	Wed.	ThU	Fri.
1	Agergizat Teshome																				
2	Aklilu Workie																				
3	Getamesay Nigusie																				
4	Mahlet Habtamu																				

Figure 5.1 AAU practicum attendance sheet for PGDT student

For instance, the attendance sheet was taken on 5th April 2017 in the Kokebe Tshiba secondary school (see figure 5.1). The week of my visit was the second week of practicum between 3rd April and 7th April. Easter Sunday was the 16th April, between the 3rd and 4th week of practicum. This sheet shows that the practicum was scheduled around one of the biggest holiday times in Ethiopia.

Although this does not directly reflect classroom pedagogy, pedagogical elements of social and cultural characteristics were not considered (Siraj-Blatchford et al., 2002). With little practical training or application of the theory learned, trainees when in their own teaching practices focused only on delivering the content in the way it was modelled to them: in a unilateral and didactic manner.

5.4.1.2. KMU

Although KMU could only provide summer PGDT training, both curriculum and content are the same as a regular PGDT used in AAU. The InsT module uses the exact same syllabus, which was designed by the MOE in 2013. As mentioned earlier, PGDT at KMU is for trainees, who have not yet completed PGDT even after starting their teaching professions. Nevertheless, they should not lag behind thanks to the summer PGDT course which covers the same learning content.

To recapitulate, KMU's major difference from AAU are 1) trainees are already in their teaching professions; 2) most of trainees are not working in Addis Ababa but in neighbouring regions; 3) the training course is offered over three years (over the course of three summer holidays). These difference might create some interesting insights particularly from trainees who have had different sorts of teaching experience in relation to ICT implementation in the classroom.

An Observation of ICT Teaching Practice

When it comes to observation, the College of Education and Behavioural Science (henceforth CEBS) chose two classes for me to observe and informed me the date of visit. The first was on the day of trainees' presentation and the second was a normal lecture led by an instructor. In the first class observation, the instructor gave a topic to the class as to why it is important to implement ICT in teaching practices. Trainees were divided into a group of four and given a certain amount of time to prepare a presentation to the other group. The instructor was sitting in the right corner of the classroom in the front and wearing the white robe. One person from each group came out to the front and presented what they discussed in groups. Every trainee referred to the content from the syllabus and their teaching experience when they prepared the presentation. One group was presenting on the type of ICT (technology) for education and the presenter said as follows:

> So, the Internet is one of the source of knowledge… no, technology
> that helps people to achieve their educational goals. As I have tried
> to mention, some examples in terms of technology. We can take that
> of Plasma programme. Plasma is also source of technology that
> makes people to achieve different types of information throughout
> the world. That is the importance of technology…[Video Clip, 3rd August 2017]

Although the instructor had clearly stated that trainees were able to search for information by any means (including mobile phone), they did not use their most advanced technology, the mobile phones in their pockets. This is because the cost of mobile data is expensive to ordinary citizens so that most people, including trainees, use their mobile phones to access the Internet only when they have free Wi-Fi. Nevertheless, the class went well because InsT syllabus contained enough information to answer the presentation question. The role of the instructor was a recapitulation of the presentation as a facilitator but he was not very engaged in the session, except calling the next group.

After the class, the instructor gave me a few minutes to introduce myself and research. I asked trainees to participate in an in-depth interview and some of them stayed to be interviewed. Most of them were presenting in the class and they would like to say as much as they could particularly on an implemented pedagogy not only that day of presentation but also the previous days.

A second observation was an ordinary lecture same as AAU InsT module. Like at AAU the instructor was in a white robe and leading the class by explaining different types of ICT-engaged teaching with some examples. However, some given examples would not be able to find in the Ethiopian context or were too technical for even the instructor to understand. To help trainees' understanding, as InsT module instructor, he could have brought images or video clips which could be given as a good example of ICT engagement. However, the instructor in KMU adhered to oral explanation or skipped explanation of those which he was not aware of.

Regarding the medium of instruction, the KMU instructor did not speak any Amharic when he led the class, which was a big difference compared to AAU. Although it might be his preference, English proficiency of trainees (current teachers) might also be better than AAU regular trainees because they are exposed to English while they are teaching. On this account, the class was relatively more interactive due to better understanding. Most of the active trainees were students who gave presentations in English the previous week. They were familiar with speaking in English, so that made them more confident to present in class. Moreover, they were eager to learn technology itself not only for teaching practice but also for their own sake. Although most of the interviewees mentioned a shortage of credit hours, those active trainees argued that the current curriculum and pedagogy of InsT module did not expand the full potential of ICT in teaching practices.

> It was obstacle for me in order to know about ICT deeply. The shortage of time itself limited us. So, this is a problem and due to this reason I did not collect information, deep information about ICT.
> (KMU S-PGDT, 7th August 2017)

However, the instructor pointed out the continuous professional development (CPD) at workplace. He thought that CPD would be a good supplement to PGDT InsT module. He said:

They need additional training. Maybe this training can be processed through CPD. CPD is training which updates teachers with recent technology…If it is not solved, there will be a wide(r) gap (training and practices in school) (Interview, 26th April 2017)

Nonetheless, KMU has three positive points which made the pedagogy more interactive compared to the AAU regular course. Firstly, the pre-existing teaching experience of teachers was a critical aspect which supported the pedagogical design of the instructor. As mentioned earlier, although every trainee in regular AAU had 4 weeks of practicum as teaching experience, most of them could not properly complete the practicum because it was scheduled near the Easter holiday (see 5.4.1.1). On the contrary, KMU trainees, who had relatively longer experience of ICT implementation in their schools, consequently the class was more interactive as they share challenges that they faced in the grassroots level. In addition, as given above, KMU summer trainees were mostly not living in Addis Ababa so that they had had different perspectives on ICT utilisation especially under the limited circumstances. Secondly, due to their own understanding, derived from experience, that students arriving late can disturb the flow of pedagogy in class they were punctual for the class. It would not be possible to find a single latecomer in KMU summer PGDT.

Thirdly, the size of the group was a distinctive factor compared to AAU regular PGDT. Having fewer trainees in class could enhance the interactivity of activities by implementing instructor’s designed pedagogy. A fundamental objective of InsT module is not only learning related-theory but also sharing and conceptualising ideas of how to utilise ICT for teaching practices. The small class size allowed for the instructor to be more flexible in terms of time management and allowed for a discussion, covering content and bring further insights to trainees. This was unlike AAU which relied upon a curriculum which contained only the generic introduction of ICT rather than focusing on how specific ICT can be utilised in an Ethiopian context.

However, what made a major impact on the pedagogy in KMU was the instructors’ personal values of ICT. The instructor said:

We have 12 teachers in Kotebe. So, teachers, they vary in their Knowledge in ICT…Some are not interested in giving a task for students to use ICT and bring a projectwork for a colleague but still teach the (IT) module…Some teachers say this is objectivesof this material

so this material could not order me to teach ICT I don't bother about that.
Of course, if students are interested in that let them learn by themselves.
This is themain problem of PGDT instructional technology module.
(Interview, 26th April 2017)

As he pointed out, there are some instructors who would like not to bother with ICT implementation for their classes. However, they are still in the teaching team for InsT module and show their disinterest in ICT. Their attitudes and thoughts affect trainees' perceptions towards ICT because instructors demotivated ICT utilisation. After all, trainees were penalised in terms of their ICT-related professional development. Two trainees said:

But lecturer cannot use ICT in PGDT level. That case I do not know why.
(KMU S-PGDT, 3rd August 2017)

We do not use ICT for our teaching rather we over-dependent on
textbooks. (KMU S-PGDT, 3rd August 2017)

Having different values among instructors on ICT makes the course less cohesive particularly with respect to ICT practices in the module. That is why it would not be possible to see practical exercise such as touching and using ICT. When interviewed the instructor said he would like to design practical sessions but cannot change the attitude of other instructors. In addition to this, the classroom assigned to the PGDT course is not ICT-friendly, instead the ICT room is allocated to Masters' degree programme. The material setting of this classroom will be discussed in the next section.

5.4.2. Materiality

When it comes to ICT practices, materiality is also as important as pedagogy because poor ICT materials are generally considered the first obstacle for ICT implementation in education (Pelgrum, 2001). On the basis of this idea, this section will investigate the materiality of two institutes. It will depict the learning environment in relation to ICT in two universities including classrooms. This learning environment does not limit the scope to ICT itself but extends to general settings that could support ICT practices. The observation took place between April and August 2017 in Addis Ababa. Like the previous section, it primarily concentrated on the InsT module.

5.4.2.1. AAU

The module is taught in a lecture theatre with auditorium-style seats in the College of Education and Behavioural Studies (henceforth CEBS). The lecture theatre was bright due to a number of windows at the back and enough light bulbs with stable power supply compared to a dark corridor of the building. There was a big blackboard in the middle at the front and the whiteboard was on the left side of the front.

There was a chair right next to the entrance door where trainees were supposed to submit their assignment when they came in. Most of the assignments submitted were handwritten and only one or two trainees submitted a word processed assignment (see figure 5.2). A few trainees, who had not finished the assignment, found a seat at the back and started to work on their assignments when the lecture began. The location of the chair for submitting their assignments near the entrance may have put pressure upon the trainees so that they could not engage in the lecture.

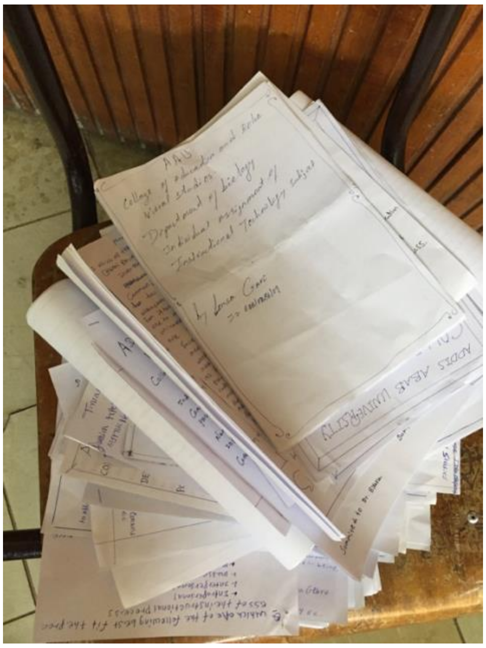


Figure 5.2 A pile of assignments on the chair

A trainee, who submitted a word processed, was interviewed because he offered to be interviewed spontaneously. He said that the reason for using computer was primarily derived from his personal interest. He emphasised that the interest in ICT made him buy a used laptop and sit in the first row of the lecture theatre.

With regard to ICT material, the lecture theatre did not have any installed materials that could be utilised for teaching practices. Instead, the instructor carried both laptop and projector in order to present PPT teaching materials. In other words, to utilise ICT, the instructor needs to bring all related materials and install them before lecture.

Organising the materials in this way sometimes makes the lecture rather disorganised. For instance, at the end of the first half of the lecture, the screen showed low battery signal and eventually the laptop turned off. Without having an installed desktop and projector, he had to bring a charger for the laptop but he forgot to bring it which interrupted both his teaching and trainees' learning.

Although having PPT slides is not prerequisite for leading the class, the instructor would like to inspire trainees by showing how PPT slides (ICT) can be supportive of teaching practices. Both the presence and utilisation of the two teaching materials, laptop and projector, made ICT integrated into the class. In addition, this simple usage became a symbol of having ICT in their training. However, the instructor still used blackboard and chalk repeatedly even if all of information was already projected on the wall. Consequently, his pedagogical design with PPT did not inspire trainees because most of the trainees would consider his way of teaching (pedagogy) with ICT was not much different from a conventional chalk and talk class.

Figure 5.3 Material setting in AAU lecture theatre

As figure 5.3 shows, this is the material setting where trainees were trained in ICT implementation. The laptop and projector were brought by the instructor who implemented ICT for teaching and learning. These materials used to belong to the CEBS but now they are used personally. An anonymous interviewee said:

The instructor used to serve as the dean of the CEBS 10 years ago.

He used his positional power to take those materials and started to use for individual purpose until now. (Interview, 16th March 2019)

His personal access to a laptop and projector was why he was the only instructor who utilised ICT materials for teaching practices. After he finished his duty as a dean, he took the materials and moved his office out of the CEBS building. As a result, the CEBS no longer owned the particular ICT equipment, or had access to it. Thus, trainees are only exposed to InsT training with some degree of ICT integration when this particular instructor teaches with *his* materials. This private ownership rather limited the chance of an ICT experience for trainees in lectures. In addition, having no projection screen, PPT slides were presented on the corner of the wall in a shape of trapezium making difficult to read. In addition, an electric wire passed through a picture of PPT slide so that also distracted from the slides. While he was using these materials, he often used blackboard and chalk for extra explanation. Therefore, from the trainees' perspectives, this way of implementing ICT could not satisfy their thirst for learning genuine ICT utilisation. Moreover, the material setting of lecture theatre would make trainees not interested in their training. Hence, they kept arguing about a shortage of ICT practice caused by a lack of ICT materials for the module.

There is a lack of material we have seen PowerPoint but not enough computer (to practise). Also, there is no (Internet) connection. This is a big problem. (AAU R-PGDT, 22nd May 2017)

However, I found a classroom with a number of computers on the ground floor of the same building (CEBS). Monitors were covered by screen covers and dust was covering both keyboard and mouse (see figure 5.4) and computer desks were squeezed in the corner of the room, which clearly represented that these materials were not in use. This means that the lack of materials reported by students could be resolved if AAU carefully examined their current ICT material conditions and assigned use of this room firstly to the InsT module. Although the size of the room was smaller than lecture theatre, these materials could be used for the IT module particularly to fulfil the trainees' demands for ICT practice in the class.

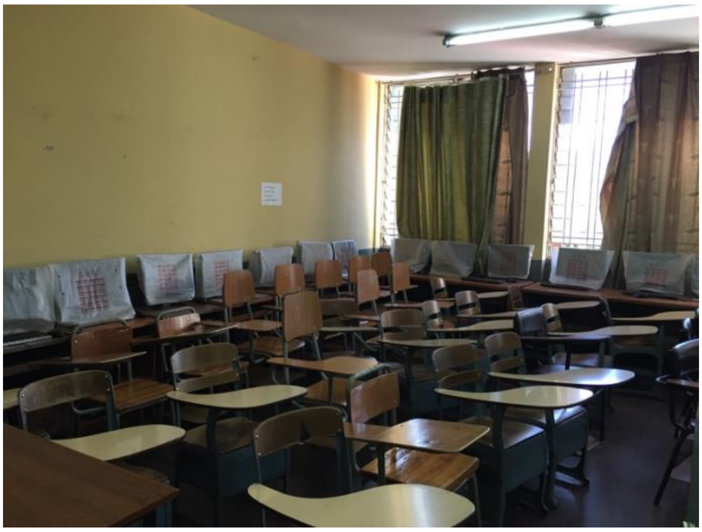


Figure 5.4 Unused ICT materials in the classroom

In addition to this classroom, the instructor informed me that AAU recently launched a smart classroom which has installed computer, projector, and screen. However, it has not been possible to run his class in this smart classroom as he teaches PGDT. He said:

> You can connect your computer and show whatever you want to show.
> They have LCD and other electronic gadgets. This is not used…
> They said establishing cost is too much and they do not want to damage…
> So, why have it? Unless your student cannot touch it. Even teachers do
> not want to go there (because) they are the hassle. For PGDT specific, they
> said that this room is established because of other purposes.
> Other purposes mean for Ph.D. students and Master students which is
> already scheduled. When students touch materials can be damaged.
> (Interview, 18th April 2017).

I was keen to observe the smart classroom, I tried to get an access but as a foreign researcher, it was not easy to observe by myself. Instead, I had to wait till when the instructor was free but he was too busy to take me to the room. I did, however, find ICT rooms, which were under the construction, in a new library (see figure 5.5). There was an ICT room at the old library in the campus (see figure 5.6), where AAU plan to install more computers for student access.

Figure 5.5 New ICT room in a new AAU library

Figure 5.6 Current ICT room at AAU main library

Although the rooms are not yet fully complete, the establishment of ICT rooms is an indicator of the vision of AAU and that it is now approaching a new phase with respect to ICT integration in teaching and learning. Regarding the smart classroom, I was able to observe two different smart classrooms in KMU, which will be discussed in the next section.

Over the summer PGDT, I also observed InsT module class but it was taking place in a different building, the Institute of Educational Research. The building was older and the classroom itself was smaller than the CEBS building and its lecture theatre. The classroom had a blackboard at the front and desks and chairs were well organised in a row. The power supply to the building was stable over the dry season, which I observed first-hand as my office was in that building.

However, electricity was not stable during a rainy season, which lasted from June to August. For instance, it was raining when the observation was conducted and there had been no electricity for more than 30 minutes. Therefore it would certainly not be possible to use ICT materials (even though the instructor carried both a laptop and projector). Nonetheless, instructor and trainees continued their ICT training in darkness - without the fundamental (intangible) material, electricity.

5.4.2.2. KMU

In the case of KMU, it faced less difficulties compared to AAU in relation to materiality. The university does have two computer labs in two libraries that any students could access and one of them has recently opened with Wi-Fi connection (see figure 5.7). With regard to Wi-Fi itself, KMU provided a more stable and faster connection than AAU. Although the number of computers were insufficient in the library, students stood either inside or outside (by the entrance) of the building to use the Internet with their mobile phone.

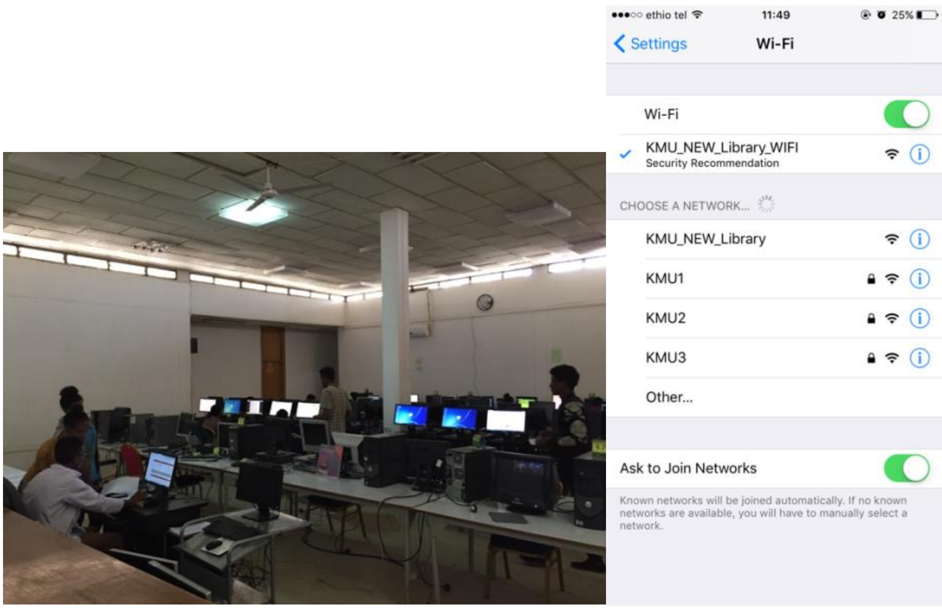


Figure 5.7 ICT room at KMU library and Wi-Fi connection

According to library ICT technician, most of the computers were donated by the USAID but the software was Linux due to the cost of a licence. Using Linux caused some compatibility issues compared to widely used operating system (OS), Windows. Nevertheless, he said that they do not have a choice because of two reasons. Firstly, the technician said that Windows needs to be updated frequently, whilst Linux does not. The OS update might be a burden for KMU because it meant that the university needed to buy a license. The second reason related to the following safety issue:

> Linux is also used in Ethiopian national bank because computers
> will not be damaged by virus. Besides, if there is a virus inside of pen
> drive, Linux does not allow it to be opened. [Field Notes. 3rd May 2017]

Although it is ostensibly due to safety concerns, the cost of maintenance is intrinsic reason for using Linux in KMU. In fact, concerns about safety are also linked to concerns about the maintenance costs that KMU will incur if they have to fix a virus. This anxiety also occasionally stops trainees' accessing ICT materials because materials might be damaged when they touch them without their knowledge. As a result, KMU students usually asked basic questions to the technician on how to operate the Linux when they need to use computers in library.

Compared with the library, the material standard of normal classrooms lagged behind. The layout of KMU classroom was a typical classroom with a blackboard at the front but desks and chairs were scattered around the classroom (see figure 5.8). Although it might be helpful for rearrangement when they need to discuss in a group, the current seating arrangements did not seem to be conducive to minimising disruptive behaviour during the class (Wannarka and Ruhl, 2008).

Figure 5.8 Material setting in KMU classroom

However, it did not much affect the day I observed because the presentation session needed to be more interactive. In addition, both classrooms that I observed lacked a stable power supply which is an indispensable requisite for running the ICT materials. As stated earlier, the summer PGDT is held over the rainy season when they often experience power cut both in schools and homes. Despite their familiarity with power cuts, it prevented trainees from practising ICT in the normal classroom, including ICT implementation of the instructor. This power interruption is not only limited to lights but also sockets. For example, I was not able to charge my laptop when I conducted the interview with trainees after their class. There were a number of sockets but none of them were working. In this case, the instructor was unable to utilise ICT even though he brought a laptop or projector for his teaching like AAU. This lack of ICT implementation and materials in KMU has been revealed clearly in the interviews. One trainee made a comparison between his undergraduate university and KMU specifically about both ICT materials and practice. He said:

> (My first degree was in) New university, new lecturer who is a fresh teacher so only used chalk and talk, only theory. There is no practice and no lab. There is not any kind of material they can copy and give us you can read theory. Even Kotebe is only theory. There is no practice but it is better than the first.(KMU S-PGDT, 3rd August 2017)

He said that KMU is still better than his first degree, even if he could not practise any while he is trained in KMU. A few interviewees, who graduated from newly established universities, commonly mentioned that universities did not provide both materials and practices. It is possible to imagine how poor his first degree training was. He made a clear correlation between no material and no practice in both trainings. This even sometimes made a few trainees register at private training centres despite the additional personal cost. In the centres, they have well-prepared materials such as one to one computer and stable power supply. In addition, they provide practical lectures that they have required from the PGDT. One trainee who used to enrol at a private centre said:

> In my first degree, I learned Introduction of computer skills. That is this is caps lock, there is not enough practice and skills. I learned by myself to (go) private training centre in Addis Ababa by paying money. It costs 400 birrs every month…Students are not normal people. They are graduate

from computer science or ICT department teachers.

(KMU S-PGDT, 3rd August 2017)

As well as normal classrooms, according to the instructor, there are smart classrooms in KMU which have installed ICT materials. To enhance practicality of the module, he applied to use the room to teach his module but it was rejected due to a similar reason as with AAU. He said that the rooms are always prioritised for Masters' classes. Although he insisted that he needed ICT materials for his module, the request was rejected from the KMU all the same.

To observe the conditions of the smart classroom, I tried to get permission in KMU and was able to observe the classroom. I observed two different types of smart classrooms with a person who is in charge of the room. He said that the rooms are normally locked and only opened when there is a class. This is mainly a security issue because there is an anxiety about technology being damaged by students if university opens the smart classroom as it does a normal one. What the first smart classroom has is merely an installed projector and a screen (see figure 5.9). Apart from this, the classroom does not have any difference - there is no installed computer and it has a similar layout of chairs and desks. Nevertheless, the manager of the smart classroom had pride in KMU's smart classroom which is still an advanced level of infrastructure in the Ethiopian context.

Figure 5.9 Material setting in KMU smart classroom (type 1)

The second smart classroom has more ICT materials compared to the first one (see figure 5.10). Moreover, there was a postgraduate lecture on the day of observation so that I was able to see the actual ICT implementation in the smart classroom. Each student was sitting in a chair with an individual computer and the instructor was presenting his

PPT on the screen in front of the room. Although it was not possible to check the functionality of each computer, postgraduate students were fully exposed to ICT-friendly learning environment.

Figure 5.10 Material setting in KMU smart classroom (type 2)

Students in this smart classroom were familiar with manipulating ICT materials compared to the PGDT trainees who did not even know the existence of the smart classroom. This made me ask PGDT trainees how they might prepare their presentations if they did it in a smart classroom. The answer might represent perspectives of trainees whether materials should come first or not.

There are certainly two clear divisions depending on the capability of ICT. The first trainer, who can use PowerPoint, said:

> If it is possible to use a smart classroom, I will prepare in a different way. I give the main point that I need to present by using that projector…we can save our time that is why we use this material. Then even the learners are also very interested in this. (KMU S-PGDT, 3rd August 2017)

On the other hand, the another, who did not have much knowledge upon PowerPoint, said:

> I think learning by the projector is better according to me, such an important way of teaching and learning process. But! As a chance, if it is given to me I do not…ah…I am not able to do such a way (using ICT)

because I have less information based upon PC, projector because of my lack of training and poor information based upon using such kinds of materials.(KMU S-PGDT, 7th August 2017)

Despite understanding the importance of ICT, students' actual ICT skills affect their attitude towards ICT implementation in a presentation setting. In the long term, these different types of attitudes determine actual ICT utilisation when they go back to their workplace. These actual practices will be discussed in the next chapter.

5.4.3. Private training centres

The field research regarding private training centres took place in December 2017. This was because one of interviewees informed me about his experience in the centre at the last stage (August 2017) of the fieldwork. My schedule and visa lasted until the end of August 2017 which meant that collecting extra data at that time was not possible. After I had transcribed and analysed interview data in the UK, I realised that it would be worth investigating private training centres and comparing the differences between university PGDT and the centres. Hence, in December 2017, I visited Ethiopia and conducted both observations and interviews in two private training centres. With respect to centre selection, centres were selected in two different areas; 1) centre A was located in a wealthy area where upper class people live; 2) centre B was in the high street of Addis Ababa where ordinary people live. By investigating two different socio-economic areas, the research could expect to find issues related to affordability of tuition fees and the standard of material settings.

To schedule research sessions, I first called them but it was not easy to communicate with receptionist in English. Instead I had to visit in person but it was difficult to meet managers in both centres. I visited two to three times again to see managers and finally met them. However, they asked me to bring in official letters[22] from the university. After handing in the letter, I was able to conduct the research.

When it comes to trainees, both centres have both university students and current teachers as trainees. To be able to hear the perspectives of trainees themselves, I asked trainees to participate in the research but no trainees from either centre were willing to. This might be because I specified the criterion of interviewing as either pre-service

[22]I assumed that I did not need to bring an official letter for private training centres because they were not formal educational institutes. However, in Ethiopia, almost all institutes asked me to bring in the official letter from affiliated institution.

teachers or current teachers, however, none of trainees were involved in the field of education when I visited. On behalf of trainees, two managers, aware of the reasons for enrolment, instead disclosed trainees' rationale for registering at the centres. The primary reason for registering on the course was due to a lack of training in university, which meant the trainees felt a need to upgrade their ICT knowledge. Centre B manager said:

> We have school teacher as trainees…secondary and primary school.
> We also have a teacher from AAU. They come to improve themselves…
> People come from Oromia or regional area and they will go to their
> country and they learn both basic and advanced skills (of ICT).
> (Interview, 19th December 2017)

The interviewee who gave the initial information about this private training centre was also from the Oromia region. It shows that trainees from the outside of Addis Ababa would require more basic ICT skills than the average.

However, upgrading was not restricted to computer courses, particularly for teachers, it extended to English as well. Centre A manager said:

> Even the teachers who teach biology or chemistry, when they teach
> the subject they have to use English so they have to be strong enough
> in the English language. Of course, it is encouraging there is a number
> of university graduates in a different subject. They want to learn
> communication because their regular class in University they do not
> learn communication.(Interview, 15th December 2017)

Teaching in English is demanding for both teacher trainees and current teachers but as English is the medium of instruction they have to cope with it. However, PGDT does not provide communicative English training and instructors also sometimes speak in Amharic when they explain (see section 5.4.1.1). The inconsistent use of English means trainees must turn to private training centres to fill in the gaps to their learning. Moreover, the OS of ICT is all in English which hinders both learning and utilisation in teaching practices (see chapter 6). That is why centres might become an alternative choice for trainees to improve their communicative English both for teaching and using technology.

5.4.3.1. Pedagogy

Although research was conducted in both centres, actual classroom observation only took place in centre B (see figure 5.11) because there was no trainees in centre A when I visited. Nevertheless, the pedagogical strengths of both centres compared to PGDT was discussed with the managers. The biggest benefit on pedagogy was that trainees could learn based on their current level of ICT knowledge. After an entrance level test, trainees are assigned to different classes and each class implemented different pedagogical approaches for trainees. Within this learning atmosphere, trainees ask questions without any hesitation and interact with each other without being embarrassed by their ICT background knowledge. Furthermore, manager in centre A emphasised the seating plan so it encouraged class engagement. He offered for me to observe a classroom setting for English and said:

> Let me show you this. This arrangement of chair makes them to see each other and build confidence. Trainers, they do not provide more of lecture but they facilitate. So this place (middle of chair) should be nothing. Please take a picture. (Interview, 15th December 2017)

For instance, a wide range of learning content is a strength for the two centres. At the beginner level, it was focused on practicality from basic skills such as Word, Excel, and PowerPoint to social media such as Facebook[23]. For the advanced class, centres provide auto CAD, C++, and SPSS to either university students or even lecturers.

These diverse classes were efficient and productive because of the small size of the class. For instance, every class in centre A has a maximum of 10 students in each class. In a similar vein, the centre B runs three different sizes from 15-20 normal size and smaller size class of either four to five size or even one to one lessons, when paying extra tuition. Due to having a fewer number of students, one computer is assigned to one trainee which makes it possible to practise while they are learning. That is why both centres limit the number of trainees in order to prevent them from the shortage of practices. For instance, a basic computer course at centre B was running with seven trainees. A computer was assigned to each trainee who could practise based on the trainer's explanation. Interestingly, the class was also taught in English and both trainer and trainees seemed comfortable with English. Although it was not directly linked to ICT implementation for

[23]Although Facebook was blocked by the government at that time of my research, most of the people were using via VPN.

teaching, practising just after explanation gave them a huge benefit compared to no practice.

Figure 5.11 Material setting in private centre B

5.4.3.2. Materiality

With respect to materiality, both centres provide an outstanding standard of access to both computers and the Internet. Although most computers were second-hand, they worked well without any defects in functionality. In addition, the wired Internet (Ethernet) was connected to each computer and Wi-Fi is also available inside the centre. Ease of Internet access encourages trainees to find more information by exercising their learning. As frequently exposed to ICT, they are getting more familiar with both materials and living in a more connected world. In a similar aspect to the pedagogy, the small size of the class enhanced material accessibility. Both centres keep maintaining a one-to-one rule so that trainees have more chance to practise by themselves.

Figure 5.12 Material setting in private centre A

Figure 5.13 Material setting in private centre B

In addition to ICT materials, centre A provided an extra exercise book to each trainee. This non-ICT material (book) played a pivotal role because trainees could practise possible challenges that they may face in the future (see figure 5.14). If trainees keep practicing the same question without trying others, they are unable to develop their creativity so that they are unresponsive when faced with unexpected situations. However, by having this book, trainees could expand their views and be able to ask advice from the trainer when they cannot understand. Then, they can manipulate the computer to apply the advice and this positive cycle makes them familiar with both materials and software. Thus, a provision of non-ICT material complements the potential of ICT to enhance the effectiveness of training.

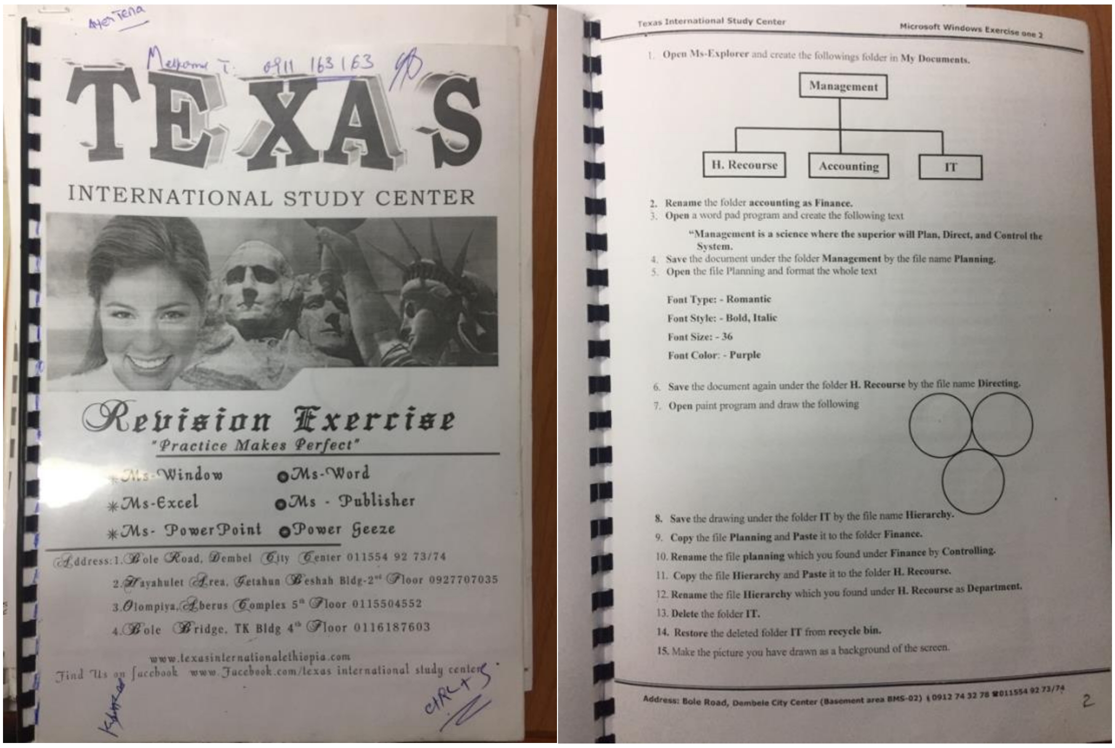


Figure 5.14 ICT exercise book used in private centre A

However, as indicated by an interviewee, tuition for centre can be a burden on a teachers' salary. The tuition fee for both centres was similar. Centre A costs 2,900 birrs per three months, that could be approximately 966 birrs per month. This is far more expensive than the tuition of interviewee's institute (400 birrs). Centre B has three different tuitions depending upon the class size which are 960, 2,500, and 4,500, respectively. Only 960 birrs class from centre B would be a similar amount with the interviewee's tuition. Although this might be affordable to the current teachers, it is not affordable to PGDT trainees who want to supplement their IT module training. In addition, according to the manager, trainees in the 960 birrs class occasionally have to share a computer with other trainees. In this case, trainees might have less opportunity to manipulate ICT materials that would not practise by themselves.

Apart from the burden of tuition fees, the private training centre was beneficial in relation to the extensive practice with ICT materials. Although the centre provided better access to materials, the impact of pedagogy should not be downplayed. Learning was improved by a small class size, trainees being able to access different levels of classes and the provision of exercise books, which indirectly supported pedagogy. These could be major differences compared with the PGDT course which is public education. However, the Ethiopian government has also been in close cooperation with both the international and private sector in order to improve the current standard within public education. This will be discussed in chapter 7.

5.5. Analysis

The chapter has presented how teacher professional development has been provided to trainees in relation to InsT module. Although the two universities faced challenges in both pedagogy and materiality, they have made up for their limitations well, given the circumstances. Above all, it has to be appreciated that the government made an effort to keep updating the InsT module based on available and prospective technologies since 1960s. Although it is getting more difficult to follow each up-to-date ICT development, the government closely cooperates with the private and public sector because it requires more financial funds. Hence, ICT-related development programmes have been heavily dependent upon international aid. The roles of international aids from public and private sectors will be discussed further in chapter 7.

Thanks to the costs associated with updating ICT materials, materiality faces stronger challenges than pedagogy. However, the aspiration of universities towards equipping ICT learning environment coincides with national ICT policy and strategy (FDRE, 2009) and approaches the transition period with more investment in materiality (see figure 5.5). Pedagogy across all educational levels in Ethiopia is designed by the government. This is why it is relatively less dependent upon foreign aids and tries to reflect characters and availability of materials in Ethiopian context. In findings, nevertheless, this pedagogical contextualisation has not been identified in teacher training classroom practice. Instructors and trainees engaged with the conventional way of teaching without ICT practices that might be critical for trainees before starting their professions.

With the aforementioned findings, this section will explore further to reflect the actual training and alternative option for trainees who chase their needs in private training centre.

5.5.1. Pedagogy

5.5.1.1. Balance of knowledge

When it comes to pedagogy, the current way of teaching ICT utilisation in practice is difficult to be seen as training which encourages ICT implementation because at present, the instructors hardly utilise technology in their classes. For example, the implementation in AAU was simply *displaying* information through ICT (laptop and projector) like a *digitised blackboard*. In other words, instructor delivered learning content via technology in a conventional manner. Modelling traditional teaching practices might encourage trainees to stick to using the blackboard because they could not observe any pedagogical difference between ICT and blackboard from the instructor. From researcher's perspective, the difference between a digitised blackboard and a conventional blackboard was whether the instructor used physical chalks or not when he explained. As a result, trainees are potentially reluctant to learn and apply technology to teaching that would not seem much difference from materials they commonly use. Although the initial idea of InsT module was providing both knowledge and skills for ICT implementation into teaching practices, using technology was reduced to merely presenting slides full of words.

To implement efficient technology in training, on the basis of TPACK, an instructor has to use appropriate technology with relevant pedagogy depending upon the subject (Glover et al., 2016). In both institutes, however, using relevant ICT (technological), with a suitable pedagogy (pedagogical) for instructing how to use technology within teaching (content), could not be found. Firstly, the AAU instructor has in-depth content knowledge which came from his long experience of leading InsT module. In addition, he possesses advanced technological knowledge that is frequently updated by attending ICT-related training provided by international organisations. However, his pedagogical knowledge was lacking. Instead of explaining how to pedagogically bring technology into actual teaching the instructor simply turned over PPT slides.

Secondly, the KMU instructor also had content knowledge due to his teaching experience as well as his ongoing doctoral degree. However, he was less knowledgeable about technological aspects compared to the AAU instructor. For example, when I was in his office for the second interview, he could not remember the password of his desktop computer. He tried to reset the computer by inserting an empty CD. I told to him he needed to insert the Window CD to reset the system but he did not listen and kept attempting to re-set the password with the empty CD for almost half an hour. Finally, he gave up and we could start the interview. I was wondering how he came to understand this way of re-setting the system. Although re-setting a password is not required knowledge or a required skill in order to become an instructor, trainees might have doubts with respect to his ICT expertise if they were in my situation.

When instructors are solely immersed in using technology, pedagogy itself is inevitably neglected and the idea of pedagogical contextualisation is also confined. In other words, the balance of three different types of knowledge is important. Otherwise, ICT implementation could be a simple ICT utilisation, similar to chalk and talk -

conventional teaching. In so doing, trainees risk not finding much difference between conventional and ICT-implemented teaching.

5.5.1.2. Assessment

According to Loveless (2011), consideration of assessment is an important part of pedagogy as it affects learning outcome. This learning outcome is specified in national educational systems or professional organisations' (university) designs of a certain curriculum (Quellmalz and Kozma, 2003). In the light of ICT-related assessment, the ultimate aim cannot be limited to acquiring basic skills but should also include learning practical ICT skills which might be needed in a future career after completing the course (ibid). According to MOE, the primary objective of InsT module is also to acquire ICT skills which specifically support trainees in teaching practices (MOE, 2013). However, at AAU, not only did teaching lack practical application of ICT skills – a lack of ICT technologies within the classroom meant there was little chance for trainees to apply their learning and lectures inevitably became teacher-centred, but, more than this, learning outside of the classroom also failed to provide opportunities to encourage ICT usage. At AAU assessment could not fully reflect the objective of InsT module because it did not include practical skill-based assessment. Assignments could be completed without the need to use ICT. For instance, if a word-processed format was a requirement, trainees would have to use a computer to make a document. However, allowing for assignments in a hand-written format (as is accepted at AAU) means, apart from a few trainees, most trainees made no extra efforts to utilise a computer in their self-directed time (see section 5.4.1.1). The role of assessment is also emphasised by AAU interviewee.

> But here (AAU) I did not use ICT for the purpose of education when
> I was in Addis Ababa University for the PGDT programme…
> Because the teachers they did not give us assignment which is asked
> you to use it. When I was in Jimma (university), lots of literature were
> given for us to search and we must refer to Google and ICT.
> But here (AAU) there is not much activities which you move to ICT.
> This is the problem. (AAU R-PGDT, 6th July 2017)

Compared with an assignment where trainees must complete research using ICT, the format at AAU allows for trainees to complete their assignment during the lecture, which, in-turn, affects their level of engagement with the lecture. Although having a format requirement might not guarantee both attaining ICT skills and stimulating engagement, the requirement at least prevents trainees from doing their assignment during lecture. This will improve trainees' concentration and increase the chance of achieving learning objectives. Therefore, in other words, a small requirement for the assessment to be typed could lead to indirect learning, for example word-processor skills and encourage active participation in the lecture. In comparison to merely creating an email account, this will be more sustainable way to utilise ICT in the long run.

5.5.1.3. Work ethic: impression from trainees

The lecturers' work ethic often influences how much they devote themselves to their profession and can be considered to have an impact upon the way of delivering knowledge (their pedagogy). A few trainees pointed out the significance of lecturers' work ethic, especially when lecturers give priority to their personal activities over their teaching profession. If we focus merely on pedagogy itself the messages of these voices could be often neglected.

As a researcher, I also received a similar impression when I conducted the interviews with instructors. For instance, in the middle of the interview, KMU instructor told me that he had to leave to catch the bus shuttle service[24]. He left the room after we confirmed the next meeting in his office. However, he did not come on the appointed day and did not give any notice. When I called him, he said that he could not make it due to his own meeting with his supervisor. I travelled almost an hour to meet him but I had to come back on another day.

In the same vein, trainees found it difficult to meet their lecturers due to their absence or busyness. In AAU, for example, many of trainees came to my office to find the AAU IT instructor who worked in the office next door; however, he was not around most of the time. Under this circumstance, a few trainees pointed out lecturer's negligence in carrying out their duties. These frustrations from trainees might arouse negative reflections upon lecturer's pedagogy and even the InsT module. Having these reflections could in turn influence the effectiveness of the class because trainees perceive that they did not properly receive the adequate training. The following comments from trainees shed light on lecturers' neglect of their teaching which resulted in less satisfaction.

ICT programme in PGDT course that is good but our teacher was

[24]Ethiopian teachers could get this service when they commute for free.

very busy because I am not 100% satisfied…The reason was that he was working in other places. He has other work. He talks he spend more time in that work. Because of his activities, I am not 100% satisfied. He takes more time for that work. (AAU R-PGDT, 20th July 2017)

As I told you, I do not have many hints (advices) because the teacher did not have time and then I did not have many sources to read… (AAU R-PGDT, 20th July 2017)

A cause of dissatisfaction was derived from the busyness and absence of InsT instructor. Trainees could not see the commitment the instructors held to teach so that minimised the learning outcome of training.

5.5.2. Materiality

Although two institutes were not fully equipped with ICT materials as the world standard, they are in the process of extending the ICT provision by establishing extra ICT room or smart classroom at the university level. As they are in the middle of transition periods, there are a number of material difficulties.

5.5.2.1. Discrimination against degree level

However, extension programmes did not guarantee ICT access to each student, particularly PGDT trainees and undergraduate students in the CEBS. Particularly, an allocation of the smart classroom to Masters programmes has been a critical factor which prohibited instructor and trainees from actual ICT utilisation. As two instructors mentioned, they were not allowed to run their InsT module in the smart classroom due to the level of degree. This means that for PGDT trainees it is not possible to use either in ICT room or smart classroom to practise their learning, despite that the university has rooms and materials. As discussed earlier, according to the AAU instructor, the response from the AAU was:

For PGDT specific, they(university) said that this room is established because of other purposes. Other purposes mean for Ph.D. students and Master students which is already scheduled. When students touch materials can be damaged. (Interview, 18th April 2017).

This shows that university assumes PGDT trainees would have higher propensity to damage ICT materials compared to Masters and Ph.D. students.

More seriously, trainees did not even know the existence of the room in which they would be able to manipulate ICT. That was why trainees pointed to a shortage of materials. Perhaps if they knew the existence of the room, it would raise a controversial point of who gets given access to the room and materials.

5.5.2.2. Demotivation led by material shortage

Whether PGDT students are able to access smart classroom or not they are demotivated by not having enough ICT materials. In the case of private centre, on the one hand, because the centre provides a computer for each trainee a lack of material is not found to be a demotivating factor. In this situation, trainees do not need to think about material shortage but focus on what and how they can manipulate ICT materials. On the other hand, trainees in PGDT are often not able to practise what they have learned and this contributes to their feelings of demotivation.

> There is a lack of material we have seen PowerPoint but not enough
> computer (to practise)… This is a big problem (AAU R-PGDT, 22nd May 2017)

> There is no practice and no lab. There is not any kind of material they
> can copy and give us you can read (KMU S-PGDT, 3rd August 2017)

These comments represent that PGDT trainees lost their interest in ICT practices due to material shortage. This demotivation is the result of no practice, meaning they are less prepared for future teaching practices with ICT. To find the correlation between materials and motivation, KMU trainees, particularly those who gave a presentation, were asked whether they would utilise ICT for their presentation if they were able to access the smart classroom. Two of the three presenters said that they would have prepared in different way as follows:

> I can make clearer on my presentation through that PowerPoint…
> rather than using piece of paper. (KMU S-PGDT, 3 August 2017)

> We can save our time that is why we use this material. Then even

> the learners are also very interested in this. So, if it is possible to use then I will prepare in different ways. (KMU S-PGDT, 3rd August 2017)

Although the last presenter did not say ‘yes’, what he said was also open to the use of ICT materials, suggesting some motivation for ICT. He went onto say:

> I think learning by ICT is better according to me, such an important way of teaching and learning process. But! I never and ever had an access to computer using PC or projector. If somebody invites me to teach such kinds of material I am not able to present even a little information through such kinds of things.
> (KMU S-PGDT, 7th August 2017)

He had an interest in ICT implementation but he was also fully aware of his incompetency in managing ICT. As given above, he is incapable of using ICT because there was no way for him to practise. Having no ICT material experience depressed him, especially when I was telling him of the existence of the smart classroom. What these trainees experienced with material shortage and the learning environment could negatively influence their motivation for ICT practices (Gasaymeh et al., 2017).

In the same vein, unused and neglected ICT materials (shown figure 5.4) were not paid attention, especially in AAU. This is another external factor of discouraging motivation for ICT practices. For instance, leaving materials behind, without careful maintenance, shows that AAU might not prioritise ICT implementation. Under this circumstance, trainees could think that the institute is not supportive for their training. According to the study of Gasaymeh et al. (2017), support from the university is an important external factor for encouraging the motivation of ICT practices. This is not yet found in the CEBS.

The current material shortage and neglected materials become crucial external factors which discourage both instructor and trainees. Although motivation is also heavily influenced by internal factors such as personal interest or attitude, the impact of deployment and embedment of ICT materials in PGDT needs to be counted. This impact leads instructor and trainees to resign themselves to stay in their current mindset about ICT. This circumstance constructs their perception towards ICT itself and possibility later implementation in education. The correlation between perception and practices will be specifically discussed in the next chapter.

5.5.2.3. Anxiety over ICT materials

Either willingness or anxiety towards objects is dependent upon individuals' knowledge and experience (Freedman et al., 1989). Trainees who do not particularly have knowledge or experience in ICT are hesitant to use the material. Having this anxiety (negative perception) over ICT materials will determine their reactions and utilisation of innovative technology in teaching (Mumtaz, 2000). When it comes to ICT materials, trainees do not have ICT-related knowledge so they are anxious about ICT use. This anxiety and fear becomes a critical determinant which makes teachers hesitant to attempt ICT integration in teaching practices (Brinkerhoff, 2006).

Apart from trainees, InsT module instructor and lecturer, who are involved in ICT and education field, are also concerned about using a USB drive. Whenever I worked with them I was asked to send documents or interview questions via email not a USB drive. It is because they are worried about using different materials which might infect their computer with a virus. Although I tried to persuade them and showed them its security on my laptop, it was hard to change their preconceived thoughts.

Furthermore, this anxiety is not confined to individuals but includes the both universities. They were seized with fear with respect to a breakdown of ICT materials when PGDT trainees have the access to the smart classroom. Having a fear of material damage made them lock the room all the time and only used for a few groups. They are worried about maintenance cost which would not be needed and so reduce the number of possible touches from PGDT trainees. Although the two institutes are proud to establish smart classrooms, it seems a demonstrative activity, where it is more important to demonstrate *having* them rather than *using* them.

5.5.2.4. Gerontocracy and power circulation inside of department

Ethiopia is a religious society dominated by Orthodox Christianity. This makes the society emphasise parental values to young generation which leads to the culture of gerontocracy (Tafere, 2013). In other words, young children learn to obey their parents and respect elders in society. In Ethiopia, elders and parents enjoyed this norm of gerontocracy and they tend to maintain their gerontocratic culture, which creates authority over the younger generation (ibid).

This cultural characteristic we can see particularly in the case of AAU instructor and his private ownership of a projector and laptop. No one could mention his ownership because he is one of the most experienced lecturers and this seniority gave him a power and authority to access or take advantage of having these materials for himself.

5.5.2.5. Value of ICT competency and social class

This private ownership is linked to a symbolic value toward *having* ICT in Ethiopia, particularly for academics. For instance, even if you are not able to properly utilise, having ICT materials, owning ICT represents ICT competency as well as social class. Especially, using Apple products, including MacBook, iPad, and iPhone, which have strong connotations of high social status and wealth.

One day, one lecturer in CEBS asked me to come his office. He had a MacBook and he always carried it even when he had a coffee with his colleagues. He told me that he bought the MacBook from Japan but he confessed that he did not know how to use it. The problem was simple. The software has not been updated for a long time so that caused compatibility issue which requires up-to-date version. After I sorted this, I had a coffee with the youngest lecturer (see 5.4.1.1) and he was glad when I told him I helped senior lecturer. The youngest lecturer said that I could half his work related to ICT in the department because he was always busy helping senior lecturers whenever they ask him how to operate their own laptops. Although these senior lecturers are not involved in PGDT InsT module, their lack of knowledge affects undergraduate students, who are taught by them and, therefore, cannot experience an ICT integrated lecture.

5.5.2.6. Extra cost guarantees ICT practices

Such, material-related issues are not found in the private training centres, a reason as to why some trainees registered at the centre and pay extra money. Although this cannot be a solution for each trainee, due to affordability, there is no alternative option for trainees who are desperate to learn ICT. As a result, teacher trainees and even current teachers attend the centre to learn and practise what they could not try in their universities and schools.

As mentioned earlier by KMU interviewee, he/she attended a private training centre even paying almost a sixth of their monthly salary from his/her pocket. The main reason was ‘there is not enough practice and skills’ in both first degree and PGDT. Most of the trainees pointed out that their first degree also did not provide enough ICT-related training including basic ICT skills. Hence, the course offered by private training centre is attractive to pre/in-service teachers.

5.6. Conclusion

In this chapter, I have attempted to investigate the InsT module in PGDT course which is designed to train teacher trainees to enhance ICT implementation in teaching. Although the standard of InsT module might not be as same as ICT-advanced countries, the Ethiopian teacher professional development has kept updating its curriculum until 2013. The attempt to explore the real condition of training concentrates upon two different aspects: 1) pedagogy; 2) materiality, which are directly linked with ICT implementation in the classroom.

As pedagogy needs to consider different aspects, this chapter has explored the relationship between instructor and trainees, medium of instruction, lateness and size of the class, factors that have clearly influenced the pedagogical dynamic in the InsT lecture. With respect of materiality, it explores the assemblage of hardware and software to find their roles inside of classroom when these combine with human (instructors and trainees).

However, after conducting the investigation into two private training centres, this chapter has found that the centres provided a course with its own curriculum and pedagogy, including providing one computer for each trainee to enhance practices. Under these circumstance, trainees were satisfied that the centre provided effective training in both theory and practices. On the contrary, the two universities have faced substantial challenges as a result of the aforementioned issues. Firstly, when it comes to pedagogy, instructors do not have balanced knowledge required for ICT for teaching practices. Assessment also could not reflect the objectives of PGDT. As well, instructors usually prioritise other things compared to teaching so that trainees did not receive enough support from them. Secondly, with regard to materiality, the universities restrict PGDT trainees access to materials. PGDT trainees are not able to use the more advanced onsite materials because of the inferiority of their level of study. This leads to a shortage of available materials and trainees report to feeling demotivated and due to having less experience, trainees are anxious about using ICT.

Nevertheless, I conclude this chapter in a more positive angle in relation to trainees' aspiration and will towards learning ICT. Despite the young age of trainees, they were not solely captured by a shortage of materiality that might degrade their learning outcome. Although they critically pointed out what PGDT needs to improve, they strived to receive different ways of InsT module training, for example the furtherance of ICT practices such as private centre. Furthermore, as Ethiopia is in a transition period, the establishment of new ICT rooms will go some way to solve the shortage of ICT materials in teacher training programme.

With the understanding of PGDT InsT module, the following chapter will explore the teachers' perception and their actual ICT practices in six selected secondary schools in Addis Ababa. In addition, it will also explore related factors that constitute the current ICT implementation in secondary schools.

CHAPTER 6: Teachers' beliefs and practices

6.1. Introduction

The importance of teacher professional development in relation to ICT implementation and adoption has been widely studied (Roblyer, 2006; Gillen et al., 2007; Hennessy et al., 2007; Samarawickrema and Stacey, 2007; De Gagne and Walters. 2009). As we saw in chapter 5, the InsT module in the PGDT programme was devised with the objective of bridging ICT knowledge and pedagogical knowledge (MOE, 2013).

However, chapter 5 showed that the PGDT InsT module fails to provide an appropriate standard of pedagogy and material for both pre-service (regular) and in-service (summer) teachers. It leads to unbalanced knowledge, and to anxiety towards ICT materials as well as implementation. This teacher training can be seen as belonging to Ertmer's (1999) first-order (external) barriers that affect teachers' use of ICT in the classroom. This barrier encompasses both hardware and software resources, teacher training, and technical and administrative supports (Ertmer, 1999; Inan and Lowther, 2010). Teacher professional development for ICT has traditionally been focused on either mastering technical skills or managing software, and has underestimated the link between ICT and pedagogy, yet this is a critical aspect of ICT practice in the classroom (Ertmer et al., 2003).

This chapter will concentrate on the second-order barriers proposed by Ertmer – i.e. factors which are internal to teachers. These factors include teachers' beliefs, perceptions and perceived value of ICT, particularly for educational purposes (Ertmer et al., 2012). Although ICT access, teacher training and resources have been improved across the world, the majority of teachers have not integrated ICT into their teaching practice (Scrimshaw, 2004; Peeraer and Van Petegem, 2011; Ziphorah, 2014; Gil-Flores et al., 2017). In line with the theory proposed by Bandura (1989), this is because teachers' beliefs strongly shape their behaviour and affect their pedagogical approaches in the classroom, alongside what have been referred to as external factors. This chapter explores teachers' internal factors affecting meaningful ICT use for instruction (Ertmer, 1999; Zhao et al., 2002; Inan and Lowther, 2010; Ottenbreit-Leftwich et al., 2010). In addition to this, as with chapter 5, this chapter will also investigate the role of material objects, or 'materiality'; people would make their own meanings and values towards materials depending on the context (Lemonnier, 2002). In other words, ICT materials in both schools and classrooms contribute to teachers' perceptions of ICT, and the extent to which ICT will be employed in the classroom.

The chapter draws upon data from six secondary schools: 1) Addis Keteme; 2) Bole;

3) Dej Balcha; 4) Kokebe Tshiba; 5) Menelik II; and 6) Yekatit 12. In these contexts, the key themes that I investigate are *teachers' beliefs* and *materiality*, and how these influence their teaching practices with regards to ICT. The following research questions are addressed:

1) How and why are ICT being used in teaching practices by teachers?
2) How do materials in schools shape teachers beliefs about ICT and its use?
3) What are teachers' reflections about Plasma TV Instruction?

The chapter will start with a brief explanation of the two main themes, 'beliefs' and 'materiality'. Section 6.3 will then provide details on the research sites; the six secondary schools where I collected the data are described, as well as the process through which these schools were selected. Details of the ICT infrastructure present at each site will also be presented here. Once this contextual information has been provided, section 6.4 will detail the teachers' internal factors emerging from the collected data, with regards to both the belief theme (sub-section 6.4.1) and the materiality theme (sub-section 6.4.2). Sub-sections 6.4.1 and 6.4.2 are each divided into six sub-sections (one for each school visited). Section 6.5 will bring these findings together, analysing the emerging internal factors in greater detail, to reach a better understanding of teachers' fundamental motivations for and ways of practising ICT in teaching.

6.2. Thematic framework

A number of studies from diverse contexts (Ertmer et al., 2012; Sánchez et al., 2012; Kim et al., 2013; Kreijns et al., 2013; Mama and Hennessy, 2013; Van den Beemt and Diepstraten, 2016; Siddiq et al. 2016) emphasise the importance of teachers' beliefs when it comes to encouraging ICT use in the classroom. Many of these also assert that having ICT materials is a precondition to ICT use. A number of factors affect teachers' beliefs, ranging from personal experience to the socio-cultural environment surrounding them. The materials inside the classroom also influence teachers' beliefs, yet this field has received little attention. This section will concentrate on these two themes, and how these impact ICT practices in teaching.

6.2.1. Beliefs

A number of studies have explored teachers' beliefs and their behaviours in the classroom (Ajzen and Madden, 1986; Kim et al., 2013). Although the definition of teachers' beliefs might be slightly different in each study, this chapter tries to consider the various types of belief as widely as possible, because even if first-order barriers are overcome teachers' beliefs affect both adoption and practices of ICT (Ertmer, 2005). These beliefs encompass self-efficacy beliefs as well, because ICT integration into teaching is unlikely to take place if teachers do not have self-efficacy and confidence in their knowledge and skills (Kim et al., 2013).

It is widely agreed that pre-existing beliefs are hard to change because they are constructed by teachers' experiences over a long time (Kagan, 1992). It can therefore be very difficult to achieve ICT integration in teaching if ingrained pre-existing beliefs hinder teachers from embracing ICT in their teaching.

In the literature, there are two main ways through which pre-existing beliefs can be changed. Firstly, having a new experience can challenge the current beliefs, and may in this way stir up conceptual changes through reflection and evaluation (Kagan, 1992). As chapter 5 argued, for example, teacher professional development could be a way of offering a new experience which triggers conceptual change both before and after joining the teaching profession. Thus, it could transform teachers' teaching practices as well as their decisions on how to use ICT.

Secondly, in addition to experience, social and cultural influences could result in belief change (Ertmer, 2005). Teachers' beliefs are shaped and influenced by the people around them in the work place (e.g. their colleagues and the principal) and belonging to their professional community (which might primarily be the school) (Becker and Riel, 1999). While teachers discuss teaching (ICT) materials and practices (pedagogy) and exchange their opinions with colleagues, their values and beliefs may undergo a transformation (Ertmer, 2005). Moreover, active leadership by the principals would enable teachers to overcome their current weaknesses and then support them to implement their newer beliefs (Ellsworth, 2000).

6.2.2. Materiality

Although materiality may not seem to provide a direct contribution to education, the relation between education and materiality is inseparable because classroom lessons will not proceed without materiality (Roehl, 2012). For instance, materiality denotes a wide array of objects, ranging from technologically advanced items such as computers, to basic items such as a blackboard and chalk. It also includes everyday equipment such as windows and walls in the classroom (ibid). In the growing literature on materiality in education this idea has been expressed as follows:

> That is, the ways that objects are given meaning, how they are used, and how they are linked into heterogeneous active networks, in which people, objects, and routines are closely connected.
> (Lawn and Grosvenor, 2005:7)

Within heterogeneous networks, materials radiate symbolic values which are constructed by society, and culture. Technology that exists within materials also expresses different values. (Lemonnier, 2002). Although physical values on a certain material might be similar, symbolic values may differ across individuals who actually engage with these materials. In turn, these symbolic values will determine whether individuals use materials or not.

When it comes to ICT materials, teachers' beliefs will affect the level of engagement with ICT in teaching practices. For this reason, teaching with ICT materials is more than a simple application of technology to classroom contexts (Ziphorah, 2014). The range of ICT materials which could be used in the classroom includes radio, TV, computers, interactive board, and even mobile phones. At the same time, it is also important to acknowledge the contribution made by supporting ICT materials, such as electricity, sockets, Internet network, and cables. The combination of physical ICT materials, and teachers' beliefs and values with regards to ICT manifests itself in the nature of the teaching practice.

Teachers in Ethiopian secondary schools are expected to use two ICT materials in their teaching: 1) Plasma TV and 2) computer lab. I will focus on how these two items, as well as other ICT-related materials, affect teachers' beliefs with regards to ICT and its eventual use in the classroom.

On the basis of these themes, the following sections will investigate how Ethiopian secondary school teachers perceive ICT and integrate it in their teaching. Before the analytical part, section 6.3 below briefly describes the characteristics and the ICT environments of the six schools to provide a background of the context where data was collected.

6.3. Research site

As stated in chapter 3, I was involved in the project carried out by a research team made up of academics from MOE and AAU. My involvement with this research team occurred through a contact I made with a local academic after reading a journal article by the research team leader, which showed that we had common research interests. After email exchanges between the two of us, he decided that it would be possible for me to join their research team. As a result, he offered me a graduate researcher position in the AAU which led to both advantages and disadvantages. For example, joining this research team was an efficient way for me to have access to schools, minimising the very heavy amount of bureaucratic procedures and official checks needed to do research in the educational system in Ethiopia. There were however also drawbacks to this arrangement. For example, I was not able to take part in the school selection. Out of the 65 digitised schools in Addis Ababa, the MOE and AAU teams selected six schools. In this way, these six schools became the fieldwork sites for the collection of the data informing this chapter. These six schools were all digitised schools under the MOE's pilot plan. Three (Addis Keteme, Bole, and Kokebe Tshiba) were selected by the MOE in the first phase of digitisation and the other three (Dej Balcha, Menelik II, and Yekatit 12) were selected in the second phase under the GEQIP II.

Before I arrived in Ethiopia, the research team had already contacted the school principals in each of the six schools and agreed to work together. The role of the principals was that of a mediator between researchers and teachers. They facilitated the data collection by scheduling the interviews with teachers, taking care of logistics arrangements, helping with the administration of my questionnaire, and being ready to assist in case of any problems researchers would have in the schools. As compensation for the time spent on these activities, principals received a sum of 1000 birrs – which was equivalent to US $45 and roughly 30% of an incoming teachers' monthly salary. The questionnaire contained a number of questions which would shed light on the current degree of ICT implementation and training received before and after starting their teaching careers. By engaging with this research, the schools would receive an intervention package (training) from AAU based on the research outcome via several workshops (this was the reason why I travelled in June 2018 to organise one of workshops).

Figure 6.1 Workshop in AAU (13th June 2018)

There were three research team members including myself from AAU, and each member was in charge of different regions. The other two were lecturers at AAU. As my research topic focussed on Addis Ababa, and due to the potential safety risks of me travelling to rural areas under the state of emergency, I was put in charge of the aforementioned six schools in Addis Ababa, while other team members led on research at schools in more rural areas. I visited all six schools but three MOE staff split their visits between them, so that they each visited only two schools. They were employed as short-term contract researchers who supported data collection in Addis Ababa. For this reason, I needed to schedule a school visit with each of them.

We circulated around 20 questionnaires to the six school principals, who then distributed the questionnaires to 20 teachers in each school. For in-depth interviews, principals selected five teachers who completed the questionnaires and were available when I visited their school. It is difficult for me to know exactly on which bases these five teachers were selected. I presume they were teachers who had good knowledge about the teaching in the school, and it is likely they were teachers with whom the principals had good relationships – at least good enough to be able to ask a favour. To triangulate the data, five students were invited for the focus group discussions regarding their experience in relation to teachers' ICT utilisation inside the classroom. Below are basic information and characteristics of each of the six schools, school principals and ICT settings, which may be expected to affect teachers' beliefs and their practices in teaching. From these characteristics, it appears clear that the six schools were chosen so as to reflect differences in socio-economic backgrounds in Addis Ababa.

6.3.1. Addis Keteme

Addis Keteme is well known as one of best schools in terms of students' performance.

It is located in the *Mercato* (the biggest market in Eastern Africa) area of Addis Ababa, where most parents were running their own businesses. The MOE staff described the students to me in this school as having amore well-off financial background than the average Ethiopian family, which results in better support in relation to education. This financial support might lead to better performance compared to other schools. With regards to ICT ownership of students, I observed that more students seemed to own mobile phones than teachers, which affects the teachers' level of exposure to ICT.
In this school, a very visible painted message on the wall stressed the importance of ICT – see figure 6.2 below.

Figure 6.2 Wall paintings in Addis Keteme

Although the message was simple and may not represent the viewpoint of Addis Keteme, none of the other six schools I visited had this type of painting on the school wall. This could suggest how the ICT club is actively run by teachers and students. Basic information on the student population and ICT materials for Addis Keteme are provided in Table 6.1.

Addis Keteme	**Gender**		
	Male	**Female**	**Total**
Teachers	123	11	134
Students	885	1,167	2,052

ICT materials	**Total**	**ICT materials**	**Total**
TV (Plasma)	51	CD/DVD	1
Video player	1	Interactive board	·
Desktop computer	182	Tablet or notebook	2
Laptop computer	14	Smart phone	·

Slide projector	1	Digital camera	2
Overhead projector	1	Printer	6
LCD projector	•	Scanner	1
Radio	4	Internet	•
Tape recorder	3	Others (please specify)	•
Source: own primary data, questionnaire filled in by the principal and ICT technician			

Table 6.1: Basic information on school members and ICT materials for Addis Keteme

6.3.2. Bole

This school is located in an upper-class area of Addis Ababa, where most of the city's newly established hotels and restaurants are situated and expanding. Students' high socio-economic status could suggest that enrolled students would perform as well as Addis Keteme, however according to MOE staff it was not the case, as most of the rich families living in the Bole area sent their children to either private schools or international schools. As a consequence, most of the students enrolled at this school have ordinary socio-economic family backgrounds – even if they are living in the Bole area.

According to a teacher who gave us a guided tour, electricity was the most urgent issue in Bole due to a broken generator. He said that the entire school is unable to use a Plasma TV for more than three months. The school was waiting to receive a new generator from a Chinese company called ZTE. This can be seen as an indicator of the precarious conditions of the school in terms of availability of resources.

The principal of Bole was implicitly known as a pro-government individual not only to the inner school community, but also to the outer MOE and AAU community. This close relationship with the government influenced Bole's role in becoming a pilot digitised school. In comparison to the other five schools, teachers' opinions at Bole were not considered important, and the principal largely followed his own wishes. Because of this, teachers were strongly monitored and controlled in their use of ICT (see section 6.4.2.2), which made them think school was not supporting them in their use of ICT in teaching. Table 6.2 represents the basic information for Bole.

Bole	**Gender**		
	Male	**Female**	**Total**
Teachers	109	26	135
Students	819	1,189	2,008

ICT materials	Total	ICT materials	Total
TV (Plasma)	53	CD/DVD	1
Video player	1	Interactive board	·
Desktop computer	150+	Tablet or notebook	·
Laptop computer	25	Smart phone	·
Slide projector	·	Digital camera	·
Overhead projector	1	Printer	10
LCD projector	3	Scanner	2
Radio	6	Internet	·
Tape recorder	6	Others (please specify)	·
Source: own primary data, questionnaire filled in by the principal and ICT technician			

Table 6.2: Basic information on school members and ICT materials for Bole

6.3.3. Dej Balcha

Dej Balcha could be described as the most active school with respect to the provision of ICT learning amongst the six selected schools. For instance, the school has been setting up its own e-library at the corner of school library with four computers (see figure 6.3). Although it was not properly working when they tried to show it to us, the ICT teacher said that the school had been working on turning hard copies into soft copies by scanning books. The MOE staff remarked how it was extraordinary that this e-library project originated directly from the school and was not top-down imposed by the government, as is the case for Plasma TV utilisation.

Figure 6.3 e-library and library search computers in Dej Balcha

This passionate commitment to ICT was also evident from their active participation in our research and willingness to be interviewed. Moreover, Dej Balcha was the only school which had no problem in using Plasma TV instruction in two classroom observations. Below is basic information for Dej Balcha.

Dej Balcha	**Gender**		
	Male	**Female**	**Total**
Teachers	116	41	157
Students	737	1,033	1,770

ICT materials	**Total**	**ICT materials**	**Total**
TV (Plasma)	64	CD/DVD	
Video player	7	Interactive board	•
Desktop computer		Tablet or notebook	
Laptop computer		Smart phone	•
Slide projector		Digital camera	
Overhead projector		Printer	3
LCD projector	•	Scanner	
Radio	3	Internet	•
Tape recorder	3	Others (please specify)	•
Source: own primary data, questionnaire filled in by the principal and ICT technician			

Table 6.3: Basic information on school members and ICT materials for Dej Balcha

6.3.4. Kokebe Tshiba

MOE selected the Kokebe Tshiba as one of the first pilot digitised schools in Addis Ababa. To meet the criteria, the school prepared a server room with cool temperature and two computer labs. This means that the school has been active in relation to the provision of an ICT learning environment. Apart from the ICT labs, the school also had an English Language improvement centre which is equipped with five desktop computers that can be used in support of the language learning (see 6.4.2.4). According to a teacher who gave us a tour of the school, having a language centre with ICT materials has helped students who would like to spend extra time on learning English.

A principal at the school actively expressed his view on controversial points in terms of the current ICT implementation in teaching. In so doing, this research sheds light on those points which might be neglected from the researcher's and government officials' point of view. It was possible to have access to his perspective because the school was selected as a subject of an aid project by a Korean aid agency. This project was broadcasted to the Republic of Korea through the main media channel. Although the aid was not specifically associated with ICT and education, this previous experience made the school principal have an understanding of international aid and project systems, which would help him to secure funding. Below is basic information about Kokebe Tshiba.

Kokebe Tshiba	**Gender**		
	Male	**Female**	**Total**
Teachers	88	34	122
Students	882	1,376	2,258

ICT materials	**Total**	**ICT materials**	**Total**
TV (Plasma)	98	CD/DVD	200
Video player	2	Interactive board	·
Desktop computer	80	Tablet or notebook	
Laptop computer	6	Smart phone	·
Slide projector		Digital camera	2
Overhead projector		Printer	9
LCD projector	1	Scanner	
Radio		Internet	2
Tape recorder	2	Others (please specify)	
Source: own primary data, questionnaire filled in by the principal and ICT technician			

Table 6.4: Basic information on school members and ICT materials for Kokebe Tshiba

6.3.5. Menelik II

This is the oldest secondary school in Ethiopia located in *Arat Kilo*, near the MOE. Due to its historic value and location, the school has normally been selected as a central venue when the MOE provides ICT Continuous Professional Development (henceforth CPD) to teachers in Addis Ababa. Hence, one of the school ICT labs was spacious and had a projector at the front of the classroom. This venue was used for CPD as well as meetings. Apart from the venue, however, teachers and students were still struggling with ICT materials when they tried to use ICT in lessons due to the poor power supply. This will be discussed further in the next section. Below is information about Menelik II.

Menelik II	Gender		
	Male	Female	Total
Teachers	120	21	141
Students	911	1,150	2,061

ICT materials	Total	ICT materials	Total
TV (Plasma)	50	CD/DVD	
Video player		Interactive board	•
Desktop computer	100	Tablet or notebook	
Laptop computer	27	Smart phone	•
Slide projector		Digital camera	
Overhead projector		Printer	
LCD projector	7	Scanner	
Radio		Internet	•
Tape recorder		Others (please specify)	•
Source: own primary data, questionnaire filled in by the principal and ICT technician			

Table 6.5: Basic information on school members and ICT materials for Menelik II

6.3.6. Yekatit 12

The building of Yekatit 12 used to be a guest palace for the Ethiopian Emperor Haile Selassie. However, the emperor converted this palace into a school to provide modern education to his people. This long history makes this school special and famous in the *Gullelie* zone. To discuss the research process, we were invited by the school principal and waited in the assistant's office for 10 to 15 minutes. There were two computers and a printer in the office and two secretaries seemed familiar with all the materials (see figure 6.4). While we were waiting, I asked the MOE staff to ask the assistants where they learned how to use the computer. They answered that they had learnt at the private training centre because the centre did not require any qualification to join. Their answer shows the role of the private centre in relation to the promotion of ICT practices, which is emphasised in the chapter 5.

Figure 6.4 The office of the secretary and the school principal in Yekatit 12

In the principal's office, there was a computer, printer, and copy machine. I asked whether he used the computer because the monitor was covered by a screen cover (like at AAU CEBS, see chapter 5). He said that he covered the monitor to protect the computer from dust after use.

In contrast to the principal's office, the ICT environment for teachers was completely different. A computer room for teachers was locked and it seemed that the room had not been used for a long time. I expand upon this in the following section based on interviews with teachers.

One of the MOE staff who visited the school with me and was part of the research team, had also worked at the school as an English teacher in the past. On the one hand, it made it easy to proceed with our research, for example by finding five research participants for in-depth interviews. On the other hand, close friendships between researcher and teachers created a relaxed atmosphere which created an adverse effect in terms of research objectivity. Below is basic information about Yekatit 12.

Yekatit 12	**Gender**		
	Male	**Female**	**Total**
Teachers	77	17	94
Students	490	753	1243

ICT materials	**Total**	**ICT materials**	**Total**
TV (Plasma)	38	CD/DVD	12
Video player	31	Interactive board	•
Desktop computer	80	Tablet or notebook	
Laptop computer	4	Smart phone	•

Slide projector		Digital camera	1
Overhead projector		Printer	3
LCD projector	1	Scanner	1
Radio	10	Internet	•
Tape recorder	5	Others (please specify)	•
Source: own primary data, questionnaire filled in by the principal and ICT technician			

Table 6.6: Basic information on school members and ICT materials for Yekatit 12

6.4. Findings

6.4.1. Beliefs

In order to understand what relationships may exist between beliefs and practice, this section will examine teachers' beliefs toward ICT in the six selected schools. Although Ethiopian secondary schools have not yet overcome the first-order barriers, studying teachers' beliefs (second-order barriers) can give important insights into their motivations and rationales behind using or not using ICT in the classroom. To explore teachers' beliefs, open-ended questions in questionnaires and in-depth interviews were the major methods used to collect data – their experiences from childhood through to teacher trainee status were explored. With regards to the in-depth interviews, the research assistant was present because we gave interviewees a language option (English or Amharic), so that they could choose the one they felt more comfortable with. There were two major overarching questions to investigate their beliefs:

1) What is your own definition or understanding of ICT?
2) Do you think ICT is helpful for teaching and learning processes?

The first question looks for a general belief towards ICT, whilst the second one is more specifically about pedagogical beliefs. Teachers' answers to the first question often took the form of metaphorical descriptions, likely because ICT itself is complicated to define – even so in the perspectives of international organisations[25]. Whilst in the form of metaphorical descriptions, the answers did not seem to stem from a mechanical

[25]For example, ICT is described by UNESCO as 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, visio/video-conferencing, etc.) (UNESCO, 2019).

repetition of stereotypes or clichés, but seemed to genuinely reflect personal beliefs constructed from experience and/or environment. On the basis of this, this chapter intends to connect with ICT practices in teaching.

A focus group discussion with students was carried out to explore ICT implementation in teaching based on students' perspectives. In other words, it was useful to gain students' perspectives so that these could be considered together with the information collected from teachers – in particular with regard to students' views on ICT implementation in the classroom and teachers' attitudes. Moreover, classroom (non-participant) observation was employed to monitor the actual ICT implementation in teaching practices; this method was carried out in two different classes in each school. Two classes were selected on the basis of convenience (availability on the day or time I visited) when we visited the school for the interview. In Yekatit 12, we were only able to observe one class because there was no other class when we visited.

Each sub-section will start with a description of what I observed inside the classroom. This description is meant to provide an illustration of both teachers' ICT practices and the functionality of ICT materials, which together provide the background for the subsequent discussion of teachers' beliefs.

6.4.1.1. Addis Keteme

Classroom observation (21st April 2017)

We visited Addis Keteme to conduct both interviews and observations. After interviewing the vice-principal, we followed him to observe ICT implementation inside the classroom. There was a computer lab near his office and coincidently an ICT class was taking place. The vice-principal asked the ICT teacher if we could observe the class and the teacher consented to our request. Our entrance created a general stir in the classroom and students started to giggle and make noise. They were excited to see an Asian guy inside the classroom, a very rare occurrence. Some students whispered "China! China!" and laughed. At this point the teacher addressed the class in Amharic and the students quietened down. Before the class resumed, MOE staff briefly explained to the whole class what we were going to do for the next 15 minutes. It was an 11th grade ICT class in a computer lab with 49 students. In the lesson, the teacher taught students how to create an Internet website. He connected the desktop computer to the Plasma TV screen to demonstrate the content that he had prepared based on the ICT textbook. The lesson was designed to be interactive, for example the teacher explained first and waited for his students to follow what he did on the

Plasma screen. The teacher said "when you click this, it moves to the next page" and waited for a couple of seconds but only a few students who were using a computer, followed and concentrated on his explanation. This is because more than half of the 20 computers were not functioning. Given this, at least four or five students had to share each working computer. Consequently, the majority of students had to work around the other computers, which were not working. In spite of this situation, the teacher carried out his lesson, and both the teacher and students seemed used to this material shortage and malfunction. He was confident in terms of his pedagogy and the content he had prepared. Although he was a person with dwarfism, his physical disability was not an obstacle to the teaching and learning process. Both his self-efficacy and confidence in ICT implementation reduced the impact of any challenges to do with materials shortage.

Figure 6.5 ICT class and students with one shared computer in Addis Keteme

The teacher, who ran the ICT class, certainly had an unusual background because he had studied ICT for his Bachelor degree and had engaged with ICT during his entire teaching career. This does not represent the average ICT competency level of teachers at Addis Keteme. The other in-depth interview participants taught different subjects including physics, chemistry, and biology. After 10 days of classroom observations, I conducted the interviews on 2nd May 2017 with five teachers selected by the principal. Teachers at Addis Keteme generally taught natural science subjects, but there were also social science teachers from other schools. One teacher chose to be interviewed in Amharic while the other four were happy with the interviews being carried out in English. For the first question, some of the teachers defined ICT as a:

i) Worldwide language (teacher D);

ii) Connection between two worlds(teacher B);
iii) Necessity for everyday life (teacher C).

These could indicate that teachers' fundamental beliefs regarding ICT were related to a concept of global connectivity. Although this connectivity may not concretely exist in their current lives, teachers expressed how and why they defined ICT in this way. For instance, a teacher who defined ICT as a worldwide language elaborated his own definition as follows:

> If you may need to connect to Chinese, European teachers or students,
> African students and teachers can join with this ICT programme.
> In this case, simply ICT is [a] language for worldwide [communication]. (teacher D)

These receptive beliefs were also relevant to the response to the second question – about pedagogical beliefs. All teachers agreed wholeheartedly regarding the helpfulness of ICT in teaching and learning. In particular, two teachers who taught science, pointed out similar points associated with visualisation. They mentioned that ICT would help to overcome limitations which they currently experienced.

> When you use [an] ICT programme, you show students practically in [the]
> laboratory and they are interested in your lesson. Also [the] teacher
> can update themselves with that ICT programme. [The] Relationship
> between teachers and students will be good. Why? Some pictures
> and diagrams are there as example[s] and give useful and more
> understanding to students. (teacher D)

> However, it [ICT] is not found in our school, [and therefore] I should select
> [discover] and connect [with ICT] other World [elsewhere]. It [ICT] gives me
> more opportunity, [and] I will search and get more ideas and give those to
> [my] students. (teacher C)

To explore the relationship between beliefs and actual ICT practices, I have gathered views on the subject from the vice principal, ICT technician and students – specifically inquiring about how they think about their teachers' beliefs and practices of ICT. The interviews with the vice principal, ICT technician, and students were usually conducted before interviewing teachers themselves about their own beliefs. This was simply due to the fact that scheduling sessions with teachers required more time and planning, notably to find suitable times around their busy teaching timetables. According to the vice principal, ICT technician and students, teachers' pedagogical beliefs could not convert into ICT practices in the Addis Keteme. First of all, the vice principal mentioned that most of the teachers had positive attitudes with regards to ICT and its integration in teaching practices. However, some teachers did not have any interest in ICT and most of them were inevitably senior teachers. He pointed to the lack of ICT-related teacher training in both pre- and in-service as contributing to the problem; he strongly believed that intensive training would change senior teachers' negative beliefs thereby increasing levels of interest in ICT.

Secondly, the ICT technician had a similar view regarding teachers' attitudes towards ICT. He said:

> Most of [the] old teachers do not have the interest in using ICT tools in the teaching and learning process. However, the youngsters do have the interest to use the technology with the exception of its scarcity. (Interview, 13th April 2017)

Having different beliefs based on age seemed to occur not only for my Addis Keteme sample but also in other countries' contexts (Peeraer and Van Petegem, 2011; Gil-Flores et al., 2017). ICT, which sounded already complicated to old teachers, made them have an aversion to a new change in the classroom. Although this attitude was more often found among older teachers, there could be younger teachers who had the same belief. After saying this, ICT technician instantly moved towards a problem of in-service teacher professional development that was the inconsistent provision. For instance, last year some of the selected teachers received on-the-job training in relation to a basic ICT operation to support teaching and learning. However, there had been no training given this year to any teachers. That was why he thought that it would not be possible to see change both in teachers' beliefs and practices of ICT implementation.

Thirdly, students made the interesting point that teachers had different attitudes towards Plasma TVs and computers. One student mentioned that many teachers had concerns with regards to using Plasma TVs for their lessons. Once he said that the other four students all promptly agreed. Nevertheless, students thought that teachers did have an interest (or even a fascination) in computers even if they rarely implemented it for the actual teaching. At the same time, one student argued that there was a skill gap between teachers and students in terms of ICT competency, and that this gap might make teachers hesitant to bring ICT into the classroom.

6.4.1.2. Bole

Classroom observation (31st March 2017)

One of the classroom observations took place in an 11th grade economics lesson on 31st March 2017. Due to the failure of the generator linked to the Plasma TV, it was not possible to see the actual use of Plasma TV in teaching. Nonetheless, the general electricity for the classroom lights was working which meant the lesson did not have to proceed in darkness. The Plasma TV, which was located on the left side of the blackboard, was locked with a padlock and the teacher used the blackboard to teach his students.

Although the research team observed the lesson from the beginning, there was no explanation to students as to why the teacher was not using the Plasma TV. In other words, the students were already aware of the three months of generator failure so there was no expectation of Plasma TV integration in teaching.

The economics teacher appeared to be in his early 50s and was satisfied with the conventional way of teaching, 'Chalk and Talk'; he held an A4 size piece of paper, which had his own notes, and used the blackboard. Although there were 30 students, interestingly, there were no students in the front two rows in the middle of the classroom. This seating arrangement was found in every classroom of all the selected schools. I found that the teacher used the first rows for his own use; he placed his textbook on one of the desks, using it as his personal desk. On the other hand, it was hard to find any textbooks on the students' desks. This was an issue not only in Bole but also in the other five schools.

Figure 6.6 Class with no Plasma teaching due to generator failure in Bole

The generator failure was the biggest obstacle for teachers, especially those who were interested in including Plasma TV into their lessons. For example, five interviewees also mentioned that they would use the Plasma TV if there was no problem with the generator. In these circumstances, their aspiration for ICT practices could not be realised inside the classroom. That was why understanding teachers' beliefs helped me to link these to their daily practices outside the classroom. Four different subject teachers were interviewed including English, Biology, Chemistry and Physics teachers on 3rd May 2017. The answer for Bole teachers to the first question tended to focus on how much ICT had become part of the necessities of daily life. Teachers explained that for them, ICT:

i) Represented irreplaceable stuff (teacher C);
ii) Made everything simple (teacher E).

The common reflection on ICT in general was *making everything simple*. For example, teacher C also said that ICT is irreplaceable because it made everything simple. However, teacher E made cynical remarks about using ICT at Bole which affected opportunities to employ ICT practices.

> we are going (to have) to beg the secretary at each and every office…
> For example, when we want to print, they did not allow us to use
> flash until you are going to use CD because they may fear virus. (teacher E)

This represented that having a positive belief towards ICT might not always guarantee ICT practices when others' (the secretary's) did not share the same beliefs.

When it comes to pedagogical beliefs, all interviewees agreed that ICT would be helpful especially when they looked up new information about a completely new area. Even if they could not use ICT in reality, they acknowledged that e-learning / MOOC (Massive Open Online Course) could be a big advantage for both teachers and students.

> I can communicate with ICT teachers. I mean you know tele learning
> (e-learning)? You can communicate from India or somewhere else
> you get courses online. (teacher D)

> Hard copy is very expensive but if you are going to use [a] café or
> restaurant which are with Wi-Fi, you may get a lot of materials so
> ICT is not just as simple as these three letters [the letters: 'ICT']. (teacher E)

Although some teachers had similar general and pedagogical beliefs, The vice-principal of Bole said that there were others who had completely different viewpoints.

> Ignorance is the main manifestation of teachers' beliefs. There are some teachers who do not believe in the importance of ICT integration within each subject. They prefer to teach using conventional teaching methods. (Interview, 31st March 2017)

The ICT technician mentioned that the real interest of teachers towards ICT might be for a different reason.

> They have interest towards technology/media in order to get information from social media but not for the purpose of enriching the classroom teaching-learning process. (Interview, 31st March 2017)

Having different interests led to inadequate ICT practices, and students noticed that teachers were not competent enough to implement ICT into teaching.

> Most of them don't have competence. How can we evaluate their (teachers')competence since they did not show us other than opening and closing Plasma screens? (Focus group discussion, 31st March 2017)

This pessimistic comment demonstrated that teachers' practical skills might not always reflect their positive beliefs towards ICT.

6.4.1.3. Dej Balcha

Classroom observation (11th April 2017)

The first visit to the Dej Balcha was on 11th April 2017. An AAU colleague stressed that a principal of the school had taken a progressive and active attitude when the school was selected as one of the six schools in Addis Ababa. In particular, he was proud of their ICT implementation in teaching and learning processes. In fact, it was the first and the last school that properly used Plasma TV and general ICT utilisation was prominent.

However, an interesting scene was captured in English class. It was a grade 11 class with 27 students. The topic was writing a survey report. Part of the pre-recorded *programme on the Plasma TV was to complete a three to four minute exercise in the middle of the lesson. When the teacher in the recording asked students to do the exercise, the classroom teacher gave a hand signal to the student sitting at the front of the class with the remote controller to pause the Plasma lecture. The reason for pausing the Plasma TV recording was because the students had not brought a textbook (see section 6.4.1.2). Hence, the teacher leant her book, which was on the second row of desks, to one group of students. When the exercise was finished, the teacher gave the signal to resume the Plasma TV lecture and said "Silence! Now listen!" While the Plasma lecture continued, she was standing beside the entrance door and looked around the class with her hands in her pockets.*

Figure 6.7 English class taught by Plasma teacher in Dej Balcha

In comparison to the other five schools, Dej Balcha was prominent in terms of the quality of their ICT learning environment. As well as use of Plasma TVs, the school had even established its own e-library system with four desktop computers in the school library. However, the utilisation of the Plasma TV in the English class calls into question whether this could be considered as teacher's ICT practice. In fact, the Plasma TV use was controlled by a student, and the classroom teacher supported the Plasma TV teacher without much engagement with students. This showed that ICT practices might not always interlink with teacher's beliefs or attitudes (Mama and Hennessy, 2013). For example, government policy of delivering lectures by Plasma TV can be viewed as a superficial implementation of ICT by teachers. In this case, ICT practices may not represent genuine beliefs and attitudes of teachers. Although I conducted five in-depth interviews (on 28th April 2017), answers for the first question can be summarised into two.

i) Making life easy (simple) (teacher D);

ii) Communicating with the world (teacher E).

Teacher D said ICT would make our life easy and gave a reason why it is important to use ICT.

> We are nowadays [living] in [a time of] globalisation. In order to have experience,
> in order to [share] knowledge with others, we should use this ICT.
> Otherwise, without ICT [it's like a] person who lives inside darkness. (teacher D)

Living inside darkness indicated how much he laid emphasis on ICT utilisation. However, his major reason of using Plasma TV was not for a pedagogical purpose. He mentioned:

> If I teach my students without Plasma, I may use 45 mins then it
> makes me tired...But when you use Plasma, it takes 20-25 mins and
> the rest will be covered by me like summarising the points or providing
> some activities and so on. (teacher D)

The second definition, communication with the world, was given by teacher E. Although she had a positive attitude towards ICT, she described herself as having *ICT phobia*.

> I don't try to even relate [use]ICT in my subject. I think I have
> ICT phobia. I don't even want to use my phone… I only refer to some
> reference materials for my student and probably students don't not know why.
> (teacher E)

Her case explained that an ICT-phobic person might have positive beliefs with regards to ICT, but that their anxiety prevents them from using ICT practices in teaching.
However, the vice principal and student group argued that the low awareness of ICT amongst teachers would be a key barrier which hampered teachers' actual ICT practices in Dej Balcha. One student insisted that a large number of teachers' thought:

> ICT is not [a] common subject so that is not useful for entrance
> exams and other exams and [so they] teach us using their own
> traditional method. (Focus group discussion, 11st April 2017)

The ICT technician had a slightly different opinion about teachers' beliefs. He affirmed that some of them are not capable of applying technology to their teaching even if they may be competent in using ICT for leisure purposes. In other words, there was a clear missing link or disconnect between ICT awareness and practice, which shows their reluctance to use ICT in the classroom.

6.4.1.4. Kokebe Tshiba

Classroom observation (5th April 2017)

On 5th April 2017, the observation was conducted in a technical drawing class for grade 12. We arrived at the classroom 10 minutes early. There were no students but the teacher had already finished to setting up his teaching materials for the lesson. The principal introduced us to him and explained our visit, including the class observation. While we were waiting for the students, the teacher texted someone and spent a few minutes on the Internet with his mobile phone. He used a ZTE-manufactured phone, a Chinese company which provides affordable smart phones in developing countries.

Once the students had arrived, the teacher used the Plasma screen as a projector which presented various types of polyhedrons. However, his use of the computer made his lesson highly teacher-centred even with quality ICT integration; during the majority of our 15-20 minutes of observation, he showed his back to the students because he seemed to be in a hurry to finish every page of his Microsoft Word content. In addition to this, he had to spend a lot of time scrolling down the document to locate specific pages. The teacher talked to himself rather than to the students, and as a result, they ended to refer to posters of different polyhedrons on the wall rather than those on the Plasma screen.

Figure 6.8 Technical drawing class with a young ICT competent teacher in Kokebe Tshiba

The teachers at Kokebe Tshiba and Addis Keteme were similar both in terms of their own characteristics and their attitudes towards ICT. Both were young and familiar with new technology. Above all, they had to utilise both computer and Plasma screens in order to deliver their teaching content to students. The technical drawing teacher in particular, would not have been able to draw polyhedrons with his hands. However, as mentioned above, rather than making teaching inclusive and connecting with his students using ICT, ICT implementation seemed to isolate the teacher from the students and missed the potential opportunities offered by ICT engagement in teaching. His rationale and way of utilising ICT was primarily for his own sake and he failed to consider pedagogical reasons for bringing ICT into teaching. As a result, he could not engage with his students in a way that would realise the potential of ICT implementation.

The potential to *'make things simple'* was a widely understood concept associated with ICT itself. Four teachers provided answers along these lines, stressing this feature of ICT. The two most salient features that emerged were:

i) Making things simple (teacher B);
ii) Being a communication device (teacher E).

The last interviewee, teacher E, perceived ICT as a communication device because:

> Everyone is involved in ICT and we cannot take ourselves out from
> this societal practice. (teacher E)

From his perspective, the current social practices, including any type of communication, would primarily proceed via ICT. That was why ICT would be a necessity to participate in society and communicate with others.

The general belief of 'making things simple' affected teachers' pedagogical beliefs. Their main worry seemed to be about reducing their workload. This made teachers focus on convenience rather than helping students' understanding. For example, the Chemistry teacher believed that ICT implementation would make teaching easier for him because he could keep the students' attention. From teacher B's perspective, using ICT allowed him to take a rest by saving time, whilst he asserted that other teachers who lacked confidence in using ICT were unable to do this.

> But I think the skill gap makes them [feel]frustrated [when using] the technology which in turn leads them to develop a negative attitude towards the use of the technology. (teacher B)

> many teachers may not understand the importance of using ICT in the classroom. (teacher B)

Students said that there was a clear division of ICT practice between positive and negative believers. However, they highlighted that regardless of different beliefs, the failure in the functioning of the technology discouraged teachers from using technology in the first place.

6.4.1.5. Menelik II

Classroom observation (6th April 2017)

In Menelik II, we were accompanied by the principal because he wanted to show us their well-equipped ICT learning environment. Our classroom observation was conducted on 6th April 2017. The first class was an 11th grade Geography lesson with 30 students. We arrived in the middle of the class with the teacher's consent. While we were waiting outside the classroom to ask about the classroom observation, I found that the teacher did not use Plasma TV and the cabinet was locked. However, once we started the observation, he promptly said something in Amharic and a student unlocked the cabinet of the Plasma TV, which was clearly not functioning. After opening the cabinet, the teacher continued to teach using the blackboard next to the black Plasma TV screen (see figure 6.9).

The principal seemed to be nervous because he had been proudly telling us how good *their ICT learning environment was. He tried to find a classroom with a working Plasma TV and found one in the next door classroom. The second class was a 12th grade Amharic lesson with 25 students. The class was also halfway through, so we sneaked into the classroom to do the observation. There was a student who was in charge of the Plasma cabinet and remote controller. A remote controller and padlock were on her desk, which was in front of the screen, and key for the padlock was tied up with the remote controller (see figure 6.10). Most of the students did not have a textbook or notebook and simply watched the Plasma TV screen (see section 6.4.1.2 and 6.4.1.3). While students watched the Plasma screen, the teacher clasped his hands behind his back and stood at the front of the classroom. There was no pause as in the English class at Dej Balcha because the speaking rate of the Amharic teacher on the Plasma screen was a lot faster than that of the English Plasma teacher. Not enough time was provided to complete the exercises which meant the class spent more time watching TV rather than participating in an Amharic lesson.*

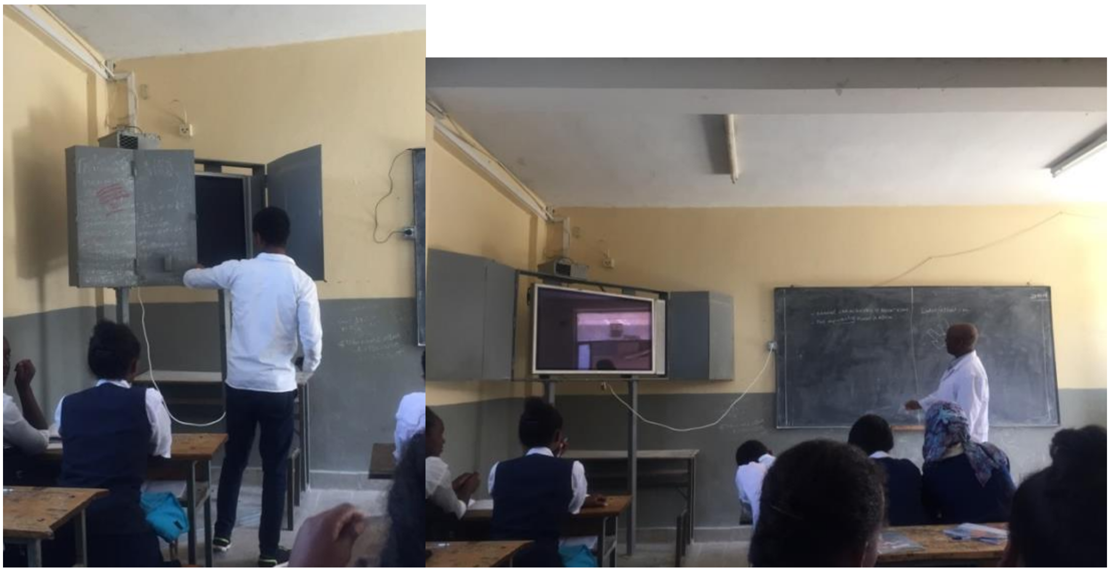


Figure 6.9 Chalk and Talk with a black-out Plasma in Menelik II

It was a contradictory scene because the functioning of the Plasma screens depended on the classroom. The two classrooms were in the same building, so it was not possible to identify what caused the malfunctioning problem. This created inequality within the school compound: depending on which classrooms they were allocated, the students might benefit from access to ICT. Nonetheless, if teachers practised ICT in the way the Amharic teacher above did, it might be difficult to achieve the potential advantages offered by Plasma technology use. In this case, the teaching did not include key elements such as teacher-student interaction, and a combination of student exercises or activities, and explanations (from both classroom and Plasma TV teachers).

Figure 6.10 A student who manipulates Plasma with the remote in Menelik II

The general beliefs of teachers in Menelik II with regards to ICT were similar to those of teachers in other schools, but the following two answers were distinctive.

i) Road to globalisation (teacher A);
ii) Multidirectional communication (teacher B).

As shown here, for teachers, ICT allowed them to interact with the world and to find information beyond the borders of their country.

> We are living in different localities around the globe (and because of)
> the help of the ICT, everything, social information will be accessible
> which is vital. (teacher A)

They believed that collecting information is a vital requirement for both countries and individuals, and ICT would stimulate this giving and receiving of information through multidirectional communication. That was why ICT was understood as a helpful component for teaching and learning. Teacher A even linked using ICT in education to *civilisation* which would help the development of the country in the long run.

> (It is) civilisation. (This is) why some countries are advanced in
> technology (and this is) why they are trying to be a leader of the country…
> because of the technology there (education). (teacher A)

Nonetheless, as mentioned earlier in this section, the actual utilisation of ICT in teaching was not easy to observe. The malfunction of ICT might be a reason. However, beyond this, the vice-principal argued that teachers' dissatisfaction with Plasma TVs, which is a fundamental type of ICT implementation in education in Ethiopia, hindered ICT practices.

> The other teachers even though they have the know-how and
> importance of technology, they lack interest to use it. Most teachers
> do not want to use Plasma. They assume Plasma is not good for
> teaching in an interactive way and say it is a one-way technology
> which is not suitable. (Interview, 6th April 2017)

In addition, he clearly argued that Menelik II teachers were not interested in ICT for teaching but focused on making a living.

> The major problem in this school is not the skill gap. Rather it is lack
> of interest (from teachers). Most teachers do not need to spend time
> to explore technology, prepare lessons based on technology and use
> the Internet to explore additional resources. Rather [they] look for part-time
> work and [are] very busy. So, [they] prefer to use the 'Chalk and Talk' method.
> (Interview, 6th April 2017)

In a similar vein, the ICT department head mentioned that teachers might not be satisfied with ICT mainly because of the failure of ICT, and this constructed negative beliefs with regards to ICT.

> But because of system failure and interruption with connection.
> This discouraged [the teachers] from using it (ICT) effectively.
> (Interview, 6th April 2017)

Students thought that there are both skills and belief gaps among most teachers with regards to technology use. A few teachers have good attitudes and beliefs about the importance of using ICT, whilst others have no positive attitudes and beliefs concerning the use of technology with the subject they teach. As a result, students receive disparate amounts and quality in terms of ICT-integrated education.

6.4.1.6. Yekatit 12

Classroom observation (20th April 2017)

The classroom observation took place on 20th April 2017 which was the week after Easter Sunday (16th April 2017). After a holiday, most of the students did not attend classes and only 36 students were in the entire school compound. Therefore, the school decided to gather every student together in one classroom. Regardless of grade, 36 students were in the classroom and taught mathematics. As students were mixed, the teacher could not properly run the lesson. With this in mind, he said that he would play a Grade 10 Mathematics lesson on the Plasma TV which would provide useful revision for Grade 11 and 12. However, the Plasma TV was not working due to system failure, so the teacher let the students do self-study. Under these circumstances, both the teacher and students might have thought that they should have not come to school after all.

The timing of the school visit was not appropriate for conducting the research. In the other five schools, there was a full crowd of students who gazed at me as soon as I entered the main gate. This was not the case at this school, where a large number of students was absent. In retrospect, this situation enabled me to experience the atmosphere at an Ethiopian school after a holiday period. The absence could not be controlled or lessened by the school and teachers, because the late return to school after holidays had become a long-standing customary practice. Indeed some teachers had started to also absent themselves during this time, and they blamed this on the students who did not attend the school. The Easter holiday made me wait for a couple of weeks before attendance levels got back to normal, and I was able to conduct the in-depth interviews. On 4th May 2017, the principal gathered five teachers and arranged the room for me to conduct the interview. He was proud of the teachers who participated in the interview because some of them had a master's degree. However, the degree did not make much difference in ICT beliefs and practices.

Before discussing beliefs, it is important to note that the data from the MOE staff, who were involved in the Yekatit 12 interview, were not of adequate quality to be used for my research or the AAU research. For this reason, data from this school primarily relies on teachers' interviews and non-participant observation given above.

The answer to the first question generally revolved around the idea of making things simple. However, there was one alternative answer, summarised as *'shaking the world'* provided by teacher D. He affirmed that ICT made it possible for him to connect with up-to-date global issues, and this borderless connectivity stirred up the world. For him, the field of education is part of this world ‘shaken’ by ICT, so he made a connection to his ICT implementation such as laptop and mobile phone in how he prepared his teaching material. He argued that ICT would not only be helpful for him but also for other subject teachers.

> Teachers can update themselves and show something through
> ICT instead of [going to the] lab and [trying to show] complex things simply.
> It makes things simple, for example, for Chemistry, Biology teachers.
> (teacher D)

However, after he showed his positive belief in ICT, he listed a number of problems associated with Plasma TV (below) Even though Plasma TVs were relatively easy to find in the school, he told me:

> There are a lot of problems, for example, its sitting position [the seating
> arrangement in the class], distraction [interruptions] in the transmission,
> set-top boxes are stolen by students. Also you may not find the lesson
> [you want on the Plasma TV]. (teacher D)

As mentioned above, Plasma TV use was difficult to observe in the classroom and the issues raised by teachers discussed above built up a negative perception towards ICT. A different perception between ICT (positive attitudes) and Plasma (negative attitudes) was mentioned by students from Addis Keteme (see section 6.4.1.1) and the view provided by teacher D showed that these types of beliefs are not limited to that school. In subsection 6.4.2, the impact of materiality on belief will be discussed further.

6.4.2. Materiality

By taking a symmetrical perspective on both human and non-human ‘actants’, the arrangement of materials inside the classroom was primarily examined, because both position and condition of materials engage directly and indirectly with teaching and learning processes. Consequently, these materials radiate symbolic values and images that affect both teachers’ beliefs and teaching practices with regards to ICT integration.
In addition, as noted in the section above, almost all teachers mentioned that infrastructure (materials) was a major factor that influenced their beliefs about ICT. Teachers’ reflections on this matter made it a worthy topic of in depth investigation.

Apart from classroom engagement with material items (i.e. materiality), Ethiopian society and culture place values on ICT materiality, which in turn impacts on teachers' personal ICT practices. In this section, although Plasma TV instruction and computer lab use are the main materials examined, other ICT-related surroundings will be investigated to determine their influence on ICT practices in the classroom. For instance, electricity and mobile phones are inevitable materials that could heavily influence ICT practices in the classroom.

6.4.2.1. Addis Keteme

There were two big wall paintings in front of the main school building (section 6.3.1). Although these were not directly involved with teaching and learning in the classroom, teachers and students unconsciously absorbed the messages that highlighted the role of ICT. The paintings influenced the values and beliefs associated with both ICT and non-ICT materials, which in turn encouraged or discouraged ICT practices at the school. When it comes to materials inside the classroom, the presence of a Plasma TV in every classroom made teachers think that they implemented ICT in the lesson. However, there was a frequent power cut that hindered Plasma TV use. As a result, teachers adhered to conventional teaching methods, rather than attempting to deal with unreliable electricity provision.

Furthermore, the content of Plasma TV instruction material also raised a shortcoming of Plasma TV implementation. Teacher A said:

> There is no introduction and it does not relate to the previous lesson.
> For example, the Plasma [TV content] [presents] things in simple terms
> such as through formulas. That is what makes [using] Plasma difficult.
> (teacher A)

Plasma TV content, as an intangible material, did not inspire teachers to engage in using ICT because it forced the classroom teacher to follow the Plasma teacher's lesson. In other words, teachers did not run their own lesson but inevitably became an assistant of Plasma teachers. As a result, teachers rather decided not to use Plasma TV.

Because teachers were reluctant to use the prescribed Plasma TV content, there was always a high demand among them to use the school computers in order to find subject information for teaching. To fulfil this demand, the Addis Keteme school allowed teachers to use a computer lab which was rare to find in the other schools. For instance, in other schools, 10 to 12 teachers would share one department desktop computer.

The computers in the lab were all manufactured by the Chinese company, Huawei, because it was the main partner of the MOE. Half the computers were not functioning (see 6.4.1.1), but the teachers accepted this because of the image they held of the Chinese product, whereby it was normal for a Chinese computer to be broken and they had to hunt for one in working order. This attitude could also be found with regards to mobile phones. Most of the teachers used Chinese phones, ZTE or Huawei, but they kept telling me *"It is all fake. I want Apple or Samsung"*.

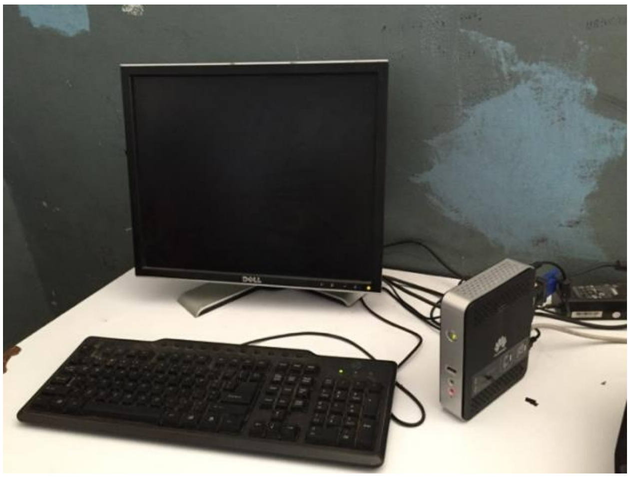


Figure 6.11 Computer provided by Huawei in Addis Keteme

6.4.2.2. Bole

Natural Science teachers were satisfied with Plasma TV because it could substitute actual experiments for visual experiments. Teacher D said:

> It helps students to visualise especially experiments we could not do in class. So, it is helpful, that is why I use it. (teacher D)

However, the failure of the generator, which led to the malfunction of the Plasma TV, resulted in no Plasma TV implementation. Teacher A said that power cuts made her stop using Plasma TV in lessons.

> We used to use [Plasma TV] but not now [as it is] not working properly…It was not working since last three or four months. Even if it works I do not (want to) use because of the light, [the] electricity [is] cut off. (teacher A)

Without electricity, there would be no way of using Plasma TV. However, her point was that she did not want to use the Plasma TV because of the possibility of a power cut. This electricity instability provoked her to think using Plasma TV was a troublesome task. Electricity in the Bole school could not be guaranteed so she did not want to take the risk of using the Plasma TV.

Apart from the generator issue, teachers were not satisfied with the poor ICT access which roused their antipathies. This emotion against school led to demotivation amongst teachers with regards to ICT implementation. For instance, the English department had one desktop computer that was shared between 18 teachers. In addition, teachers did not have access to a computer lab as in Addis Keteme. As a result, teacher E tried to find support outside of the school on his own and received 16 laptops from an NGO. At first, the principal did not want these because he thought that the NGO was dumping old laptops at his school. To persuade principal, the NGO showed that the laptop worked well and the principal approved to receive those 16 laptops (see figure 6.12). However, when teacher E showed me the laptop donated from the NGO, in reality many of them were not properly working.

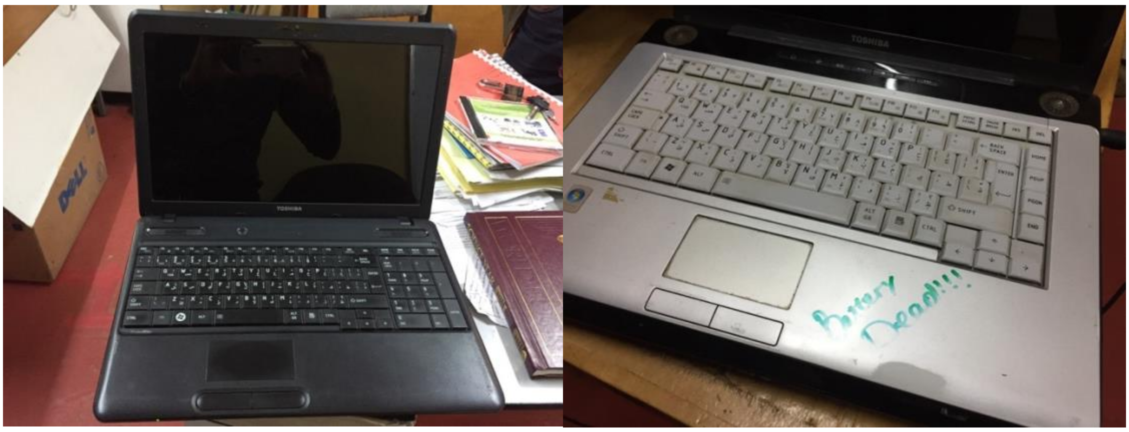


Figure 6.12 Laptop donated from the NGOs in Bole

In June 2018, I travelled to Ethiopia to organise and participate in the workshop held in AAU. The workshop was a kick-off meeting to explain the intervention package[26] to selected schools. I was initially invited as a presenter but the plan was changed. As a result, I supported the workshop as a research team member. On 12th June 2018, I visited Bole to hand over the invitation letter. Thanks to this visit, I had an extra chance to observe

[26]AAU (Institute of Educational Research) will provide teacher training and school management to improve ICT integration into classroom.

the Plasma TV system at Bole and whether the school had resolved it. I was accompanied by a Physics and ICT technician, who I had interviewed in 2017. The ICT technician said that the Plasma TV system would work well because of having a new generator. However, it was hard to find a classroom where we could see a Plasma TV in operation.

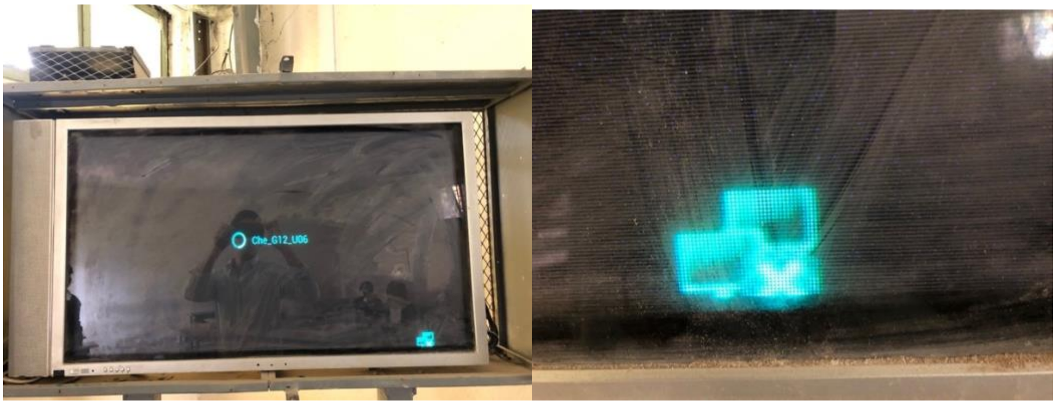


Figure 6.13 System failed Plasma in Bole

Figure 6.14 Normal Plasma system and the remote in the next classroom in Bole

After the observation, they introduced me to a volunteer teacher and we had a short conversation about her experience in the Bole school. I asked her to share any ICT-related experiences. She said that her colleagues in the department asked her to do all the typing and editing jobs in relation to exam papers.

> One day some of teachers brought me hand-writing exam papers
> and asked to merge those into a word-format. They also asked me how
> I can type so fast. I said you need to practise many times but they said
> we do not have computer like you. While I am spending time here I personally
> found that they did not want to be bothered with extra work. Ironically,

at the same time, they would like to use computer well without making an
effort. They simply used *not enough computer* as an excuse.
[Research note, 12th June 2018]

Moreover, she informed me that her colleagues complained about the control of the school in relation to printing. For instance, the printing approval system in the school was that teachers had to report the number of pages and the reason for printing to the vice-principal, since the printer was in the vice-principal's office. When the vice-principal had approved and signed the printed paper request, then teachers went to the copy room with the signed request. The person who worked in the copy room, would check the signature of the vice-principal and copy it. Due to this monitoring and reporting system, teachers preferred not to print, which meant they did not prepare teaching materials. Alternatively, teachers would ask a voluntary teacher, who was less monitored, to print their teaching materials.

6.4.2.3. Dej Balcha

With regards to ICT material access, the Dej Balcha provided an outstanding environment compared to the other schools. The ICT technician said "We have four IT labs connected with Internet, and three Wi-Fi connection areas." Moreover, each department had one desktop computer and one laptop that connected to wired Internet. This was relatively affluent provision compared to the other five schools.

However, teacher D said that the department laptop was mainly used by him and I asked why.

Actually, it is not personal (laptop) that is just given to the department.
So we can share each other. But since I am English department head…
most of times I use it. (teacher D)

It sounded as if there might be unequal access to either the laptop or desktop computer based on status within the department. If so, the rest of teachers would not be able to use ICT for their teaching.

Figure 6.15 Computer lab with many broken computers in Dej Balcha

The observation of the computer lab was helpful to find other materials outside the department office. I observed one of computer labs that had 20 computers manufactured by Huawei again, but seven to eight computers did not work. Nonetheless, black and error screens were turned on and used the electricity. The classroom would not look like a computer lab if there were no computers or Plasma screens. Chairs were scattered here and there and a long black wire was hanging from the wall from the front to the back of the room near the ceiling. The venue and the arrangement of materials might discourage users from even coming to the lab.

I asked about the alternative option of using a mobile phone to download information because there were three Wi-Fi areas. However, most of teachers said the signal was too weak to search the Internet. Then teacher D mentioned the expense of mobile scratch cards that he had to buy to use mobile data.

> Actually, it is expensive and not affordable because it takes (costs) money. So sometimes I just simply focus on textbook and develop and prepare my lesson without having any further information. (teacher D)

Due to costly data, what he normally did with his mobile data was something to do with texting and social media. This was still counted as ICT practices but more about entertainment usage.

6.4.2.4. Kokebe Tshiba

When it comes to Plasma TV, no teacher said that they used Plasma content this year. In the case of technical drawing (see 6.4.1.4), the teacher was using Plasma as a presentation screen connected to a desktop computer. Teachers pointed out a number of failures as follows:

> We don't use (Plasma)…cable problems, set-top box not working.
> (teacher B);

> There is the light (electricity), technical problems…it fluctuates…Not sufficient.
> (teacher E)

As the Plasma system needed stable electricity, the Plasma TV became a useless material unless teachers prepared their own content, like teacher B. Teacher E calmly assessed their ICT integration in education. He pointed out that actual ICT utilisation was difficult to find in pedagogical practices. He said:

> There is no ICT material (utilisation) except for writing and preparing for
> our notes and examination paper. For classroom purposes, there is no
> ICT materials at all. (teacher E)

This limited ICT utilisation for either notes and exam papers was caused by a shortage of materials. According to teacher E, materials provided by the school were primarily for students not teachers. As a result, teacher felt demoralised about their aspirations for ICT practices in teaching.

Figure 6.16 English language improvement centre in Kokebe Tshiba

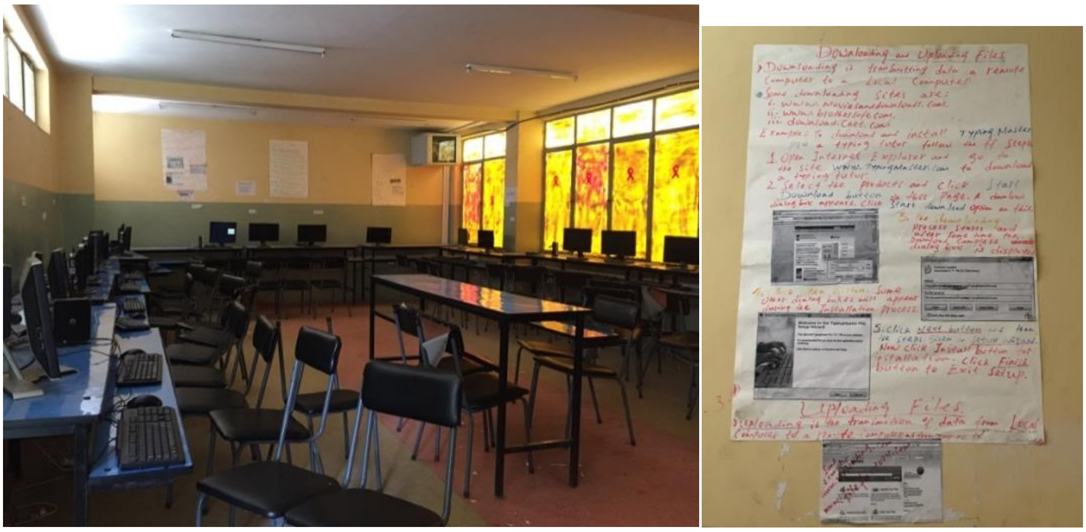


Figure 6.17 Computer lab and flip chart with information in Kokebe Tshiba

To see the condition of ICT materials for students, we asked the ICT technician to show us the setting. He took us to the computer lab and English language improvement centre. There was no lesson in either classroom and they were locked for security purposes. First of all, the computer lab was organised well and clean. It looked very different to the one at Dej Balcha. The first impression of the lab illustrated that the school had a will to take care of ICT materials. Moreover, four to five flip chart papers, which had information about using computers, covered the wall. The papers gave detailed information, for example on screen capture. Although the information was at a basic level, it might also be helpful for teachers. Secondly, having an English language improvement centre with five computers was impressive. The technician said that students could use the centre after having permission to do so.

6.4.2.5. Menelik II

On 5th April 2017, we primarily looked around the ICT labs at Menelik II. According to the vice-principal, the school had six labs and we visited three. As the school had a long history and social reputation, the school received privileged support in relation to ICT materials. For instance, the condition of the labs were neat and tidy and all three labs had a projector. As given above in section 6.3, the average number of projectors per school was one. Although some schools possessed more desktop computers, the functionality aspect of desktop computers was prominent in the Menelik II school. The computers were again made by Huawei, and interestingly the keyboards had some keys marked in Chinese.

Figure 6.18 Computer lab and the keyboard with the Chinese letters in Menelik II

The following two teachers said that teachers would not benefit at all, even though the school had a well-equipped ICT lab. He said:

> Nothing has been given to teachers like me. Not at all. I heard one department head [was] provided [with] a laptop, I see some department head is working with [a] laptop in preparation for the exam or tests. Apart from that [there is] no accessibility at all. (teacher A);

> For my work, [there is] no material support, frankly speaking, [in] our department we don't have any computers and we don't have any projectors and I am not using any technology. (teacher D)

Both teachers believed that ICT should be a part of all our lives because ICT would make people a country leader. However, they could not actualise their beliefs into practices because the school did not provide ICT materials for their utilisation. In addition, according to them, access to material was not fair and clear depending on the department and among teachers.

In the third and last lab, there was an ICT class. There was no electricity but the lesson continued in darkness. There were some students who were hard of hearing so the assistant teacher supported the main ICT teacher by using sign language. The lesson was running without any practical activities but there was no other way to run the lesson.

Figure 6.19 ICT class without electricity in Menelik II

The situation here with unreliable electricity could be similar to the Plasma TV situation in the Menelik II school, which was like a lottery i.e. one would never know if the electricity was going to work (see section 6.4.1.5). When you were in charge of a classroom where Plasma worked, you could use ICT for your semester. If not, you would not be able to use it, even though you tried every possible means. Both the vice-principal and the ICT department head were aware of the system failure of Plasma TVs but they also did not know how to repair the problem. Moreover, the ICT department head was worried about teachers' discouragement as a result of the system and material failure. It demonstrated that material failures affected teachers' positive beliefs and blocked the linkage with actual practice in the classroom.

> Teachers [are] discouraged from us[ing] it (Plasma) effectively because of system failure and interruption with connection. (Interview, 6th April 2017)

Under this circumstance, two of the interviewees provided their rationales for using Plasma TV.

> We are forced to. There is a pressure from the government, from the regional education bureau [which makes it] compulsory to use Plasma. (teacher A)

He said that he used Plasma TV because of pressure from the government. In other words, he might not use Plasma TV if there was no pressure to do. This type of ICT integration would not stimulate the advantages of ICT.

But simply there is Plasma and we turn on that and we are attending
and students (are) attending that class. But using projector and computer
we can choose different things we can teach differently. (teacher D)

Although he was a teacher, he felt he was attending the class as student when he used Plasma TV for teaching. Instead, he said he could teach differently if other materials were provided. Using Plasma TV might discourage creative ways of teaching even if through using it a teacher was integrating ICT in class.

6.4.2.6. Yekatit 12

On the day of our visit, there was no ICT teacher who was in charge of the ICT lab. No one had a key to access the lab so that it was not possible to see either the room or materials. In addition, as explained in section 6.4.1.6, the Plasma TV was not working when we conducted the observation in the combined class.

With regards to ICT materials, all we found at Yekatit 12 was a locked teacher's ICT room. Although we could not enter the room, it was possible to imagine how the school provides ICT materials to teachers. For instance, I was able to see a couple of monitors through a small blurred window in the door. Those were on the same desk but there was no computer connected to the monitors. Chairs and torn boxes were placed here and there. It was clear that the room and materials had not been used for a long time.

Figure 6.20 Locked teachers' ICT room in Yekatit 12

Due to insufficient observation of materials, in-depth interviews with teachers made a contribution to the investigation about materials. When it comes to Plasma TVs, all five teachers initially took account of Plasma TVs as ICT materials provided by the school. However, four out of the five teachers simultaneously pointed out the malfunction of Plasma TVs caused by unstable electricity provision.

> [A] critical problem is [the] electrical problem - sometimes it may be off. In that case we change to teach them without Plasma. This is a big problem in current situation. (teacher D)

> There are problems, for example today there is no light, power off. (teacher C)

Apart from unstable electricity, teacher E gave interesting feedback about what discouraged him from using Plasma TV in his teaching. He did not use a Plasma TV because of the content, even if there was electricity. He said:

> sometimes [the] Plasma teacher skips answer…and my answer (thought) can be different from [the] Plasma teacher's. And also, the speed is too fast. (teacher E)

As it is pre-recorded content, classroom teachers were bound to the pedagogical approach of the Plasma teacher if they decided to use Plasma TV in lessons. In other words, classroom teachers just followed how the Plasma teacher ran the lesson without pedagogical autonomy. Under this circumstance, the teacher had experienced holding a different view to that of the Plasma teacher, and further the Plasma teacher spoke very quickly. This experience had made him lose confidence in himself in front of his students who sometimes trust the Plasma teacher more than him. If teachers had a chance to go through the Plasma lesson before their class, it would be very helpful for them to prepare for such unforeseen situations. However, there was no way for teachers to watch the pre-recorded lesson before leading the class. As a result, he preferred not to implement Plasma TV use into his teaching.

On 11th June 2018, I visited the Yekatit 12 school with my colleague from AAU to provide the principal with information about our workshop. This visit was much shorter than the Bole one because my colleague had an appointment immediately afterwards. What I focused on was the teacher's ICT room, as it could have improved during the year's gap between the visits. However, there was no improvement whatsoever, apart from changing the name to *Plasma technician office*. My colleague said that he assumed the ICT room would remain the same unless the principal decided to make changes. This was the sole update from Yekatit 12 after a year, however, I believe I could have found further changes had I spent longer there. This is why I visited the Bole school on my own, so that I could spend more time there after having provided the information about the workshop (see 6.4.2.2).

Figure 6.21 Teachers’ ICT room changes to Plasma technician office after a year

6.5. Analysis

6.5.1. Beliefs

To explore teachers’ beliefs, this research collected teachers’ own reflections and the views of a vice-principal, an ICT technician and students from each school, with the aim of triangulating the information received from these sources. A key aspect which emerged was teachers’ use of metaphors to illustrate their beliefs towards ICT, which will be discussed below. Their recurrent recourse to metaphors may indicate the difficulty they had in expressing their beliefs through precise and clear-cut terms, and their willingness to use figurative language. It has been argued that people often use metaphors to express how they feel, think, and believe towards phenomena they cannot fully understand, rationalise or experience (Csorba, 2015; Öztürk and Dagistanhoglu, 2018).

Throughout the interviews, the research encountered various metaphors that provided indications towards teachers’ beliefs. In short, both the general as well as the more strictly pedagogical beliefs indicated positive feelings towards ICT adoption in education. Teachers perceived that ICT integration in education was helpful for their teaching practices. However, a large gap between beliefs and the actual practice was observed, even if teachers believed in the potentials and usefulness of ICT in education. On the basis of this, teachers' beliefs will be categorised in the following sub-sections.

6.5.1.1. Simplicity

Apart from some distinctive metaphors, the most common beliefs of interviewees were associated with *simplicity* which could be maximised through ICT implementation. These beliefs extended to pedagogical beliefs which made teachers think ICT could make teaching practice simple. As described above, having Internet access via mobile phone allowed teachers to be aware of other ways of teaching in different locations around the world. However, this advanced level of ICT-integrated teaching was not feasible in the Ethiopian context.

With this expectation, teachers believed that ICT would make their teaching easier because they would not need to speak and prepare teaching materials if they used ICT (Plasma). In other words, the rationale for using ICT was primarily derived from increasing an individual's ease rather than improvement of quality education. Though not true of all teachers, those teachers who used Plasma TVs, unconsciously said that they employed ICT because it saved both time and their energy. The following was mentioned by teacher D from Dej Balcha.

> If I teach my students without Plasma, I may use 45 mins then it
> makes me tired...(teacher D)

This demonstrated that his pedagogical activity did not focus on educational purposes but on his own comfort. I started to wonder why teachers prioritise their comfort over teaching practice. Throughout the research, the answer has been getting clearer, particularly with the vice-principal in Menelik II and teachers in Bole. It related to teachers' second job.

> We have a teacher, who does not appreciate his job in the Menelik II.
> He is working in [a] Catholic school as a part time [teacher] and he spends
> more time there. He just takes Plasma for granted and does not prepare
> anything here. [Research Note, 5th April 2017]

The school cautioned the teacher once students had reported him for being irresponsible in his teaching, firstly because it was illegal to have a second job as a teacher, and secondly for the harm to his peers and students.

This might have been a unique case, so I discussed this topic with a few teachers in Bole while we had coffee in the school cafeteria. This conversation took place on 12th June 2018 during my second visit to inform them of the workshop. They said that it was common to have a second job. It was not limited to being a part time teacher in another school, but could include being a private taxi driver, shop owner, and private tutor. Most teachers who had a second job were young teachers and had a second job because of their unsatisfactory salary. That was why those teachers were happy with Plasma TV-based lessons, which allowed them to relax, and simply moderate discussion instructed by the Plasma TV teacher. In other words, their beliefs about *simplicity* were interpreted in different ways because ICT (Plasma) allowed them to take on extra work by making their first job simple. As a result, ICT use in lessons by teachers with these attitudes would not match the aim of government and differentiate Plasma teaching from the traditional *chalk and talk* method

6.5.1.2. Being intellectual and upper class

When it comes to Ethiopian teachers' beliefs, they hold similar beliefs as other countries' teachers. This was because, through the Internet, the Ethiopian teachers saw how other teachers all over the world utilised ICT in teaching practices. That was why many interviewees kept mentioning e-Learning or MOOC when they described Plasma TV use.

Teachers were therefore eager to possess their own laptop and wanted to use it for teaching as well as for themselves. ITU (2018) estimates that only 4.9% of households has a personal computer in Ethiopia. This is almost half the average for Africa as a whole (8.9%) and this figure shows that a personal computer is still available only for the privileged. However, this research found that the few teachers who had laptop, usually used it for personal purposes and not for teaching-related reasons. More interestingly, they felt a pride in having the laptop itself which was evident when they said they owned their own laptop, or even carried their laptop in public spaces. (see chapter 5 AAU lecturer).

When it comes to mobile phones, although 59.7% of the Ethiopian population owns one only 18.6% of the population uses the Internet via their personal computer or mobile phone (ITU, 2018). The reason for limited Internet usage among mobile phone holders is firstly due to limited access of Wi-Fi connection, and secondly due to the affordability of mobile data plans. The following comment from teacher D at Dej Balcha proved the influence of data affordability.

> Actually, (with our salary) it is expensive and not affordable. So, sometimes I just simply focus on [the] textbook and prepare my lesson without having any further (up-to-date) information. (teacher D)

It illustrates that 1) possession of a laptop; 2) using mobile phone data radiated the image of being an intellectual and upper class. For instance, most teachers usually bought a 10 Birrs mobile phone scratch card, but my colleagues, who were professors at AAU, bought a scratch card of at least 50 to 100 Birrs without hesitation. In other words, ICT-related materials and access to the Internet required finances which would only be affordable to a few. This is why most private ICT training centres were dominated by businessmen who could afford to pay their tuition fee. As a result, for teachers, ICT materials themselves presented an upper class image.

6.5.1.3. Obligatory

Regardless of ICT material ownership, teachers were active and autonomous ICT users for their personal leisure. However, with regards to ICT teaching practices, they did not have the same attitudes compared to personal usage of ICT. As illustrated earlier, personal inducement and social images of ICT did not match teachers' general and pedagogical beliefs towards ICT.

In a similar vein, the government's coercive approach towards policy implementation created an antagonistic feeling. Some schools even monitored the usage of Plasma TV and any ICT materials, even if their system frequently failed. This coercive approach implemented across the country by the government and the regional education bureau required cooperation from every secondary school. This was why teachers from Bole insisted that they were monitored by the school and they needed to report when they used any ICT-related materials including the school telephone (see figure 6.22). In addition, the Menelik II school collected paper slips from the student who was in charge of Plasma TV monitoring, to check whether teachers were actually using Plasma TV in their lessons. However, what teachers complained that they did not receive any training on how to operate the Plasma TVs. All they had was one paragraph or short verbal explanation in the PGDT InsT curriculum. Teacher B at Addis Keteme said:

Most of [the] time teachers do not know how to use it (Plasma) especially how to use [the] remote properly. (teacher B)

That said, teachers would not need to worry because there was a student who was in charge of Plasma TV manipulation in every classroom.

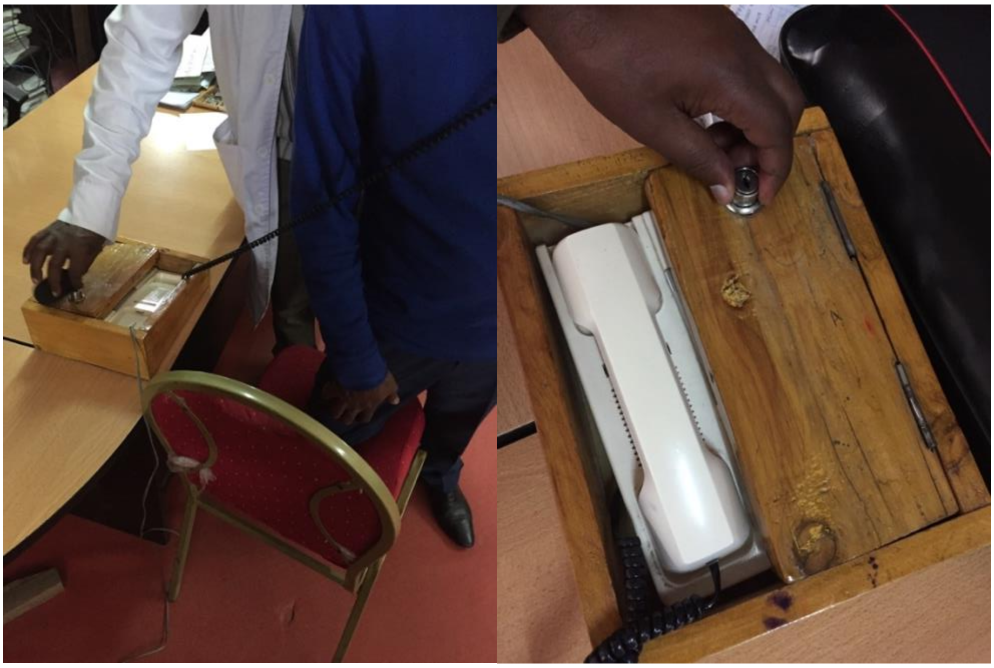


Figure 6.22 Unlocked school telephone in order to use by teachers in Bole

In addition, this antagonistic feeling also came from the Plasma TV's pre-recorded content, because it restricted teachers' autonomous pedagogical design. Teachers are supposed to implement ICT, primarily via Plasma TV use, which might not be suitable for their students. To make students understand, pedagogical autonomy would be crucial to amend teaching methods. However, with Plasma TV, the classroom teachers tended to assist the ICT (Plasma teacher) to teach students. Teacher C at Addis Keteme argued:

The course covered by [the] Plasma teacher may not relate sometimes to the course. It is out[side] of [the curriculum] content so we [classroom teachers) are always trying to cover what he/she teaches [in] the Plasma which is not in the main contents in the textbook. (teacher C)

In other words, the main teaching agent was no longer the classroom teacher and the government's excessive emphasis on ICT has devalued the teacher leading the class.

6.5.1.4. A sense of inferiority

Although most interviewees had positive beliefs towards ICT itself, they did not agree that the Plasma TV and computer labs currently supported their teaching. Having no autonomous pedagogy due to compulsory Plasma teaching worsened the teachers' beliefs as well as practices. In reality, classroom teachers became a supplementary component to the Plasma TV, and especially the Plasma teacher. During observations of lessons, I noticed that the teachers who utilised Plasma TV, did not look excited but rather seemed bored and preoccupied with something else. As illustrated in section 6.5.1.1, some of them saved their physical energy for their second job, but Menelik II's vice-principal told me something interesting; there were a few teachers who were competitive with their use of Plasma TV. Their competitive spirit transformed them and manifested itself through envy of the Plasma teacher. He said that they emulated Plasma teachers because they thought students preferred the Plasma teachers to them. The Plasma teachers were Western people except for the Amharic teachers, and they were native English speakers, which sounded more intellectual. This created a lack of self-confidence in the classroom teachers, and made them dislike the Plasma TV itself, and meant they considered themselves as less competent than Plasma TV teachers. As a result, they also decided not to use Plasma TV in their teaching.

Teacher D at Dej Balcha clearly showed his sense of inferiority to the Plasma teacher, but ostensibly his rationale for using Plasma was 1) saving time; 2) less experience.

> Since I am a teacher, I use Plasma because one it saves my time
> and second Plasma teachers are experienced. I think that is delivered
> from South Africa. So they have experience so they can teach my
> students more (better) than me. That is the point why I use Plasma.
> (teacher D)

In addition, as given earlier in section 6.4.2.6, if the classroom teacher's answer to an exercise is different from that of the Plasma teacher, classroom teachers might feel embarrassed in front of their students (cf. Yekatit 12 Teacher E).

6.5.2. Materiality

Teachers counted materials (infrastructure) as an influential factor that affected their attitudes towards ICT. They argued that it was difficult to identify if either personal experience (teacher training and ICT practice) or materials were the most important factor influencing the nature of their relationship with ICT in teaching.

Although both general and pedagogical beliefs were positive, these beliefs did not connect with ICT practices inside the classroom. This demonstrated that the gap between beliefs and practice was not merely caused by individuals' beliefs, but also by the perceptions associated with the materials themselves. For instance, the ICT materials themselves could transmit a symmetrical non-human actor value in the Ethiopian context. Even though teachers' beliefs were constructed, materiality might overrule individual beliefs particularly associated with ICT. In this regard, the following sub-sections will focus on the impact of ICT materials upon teachers' beliefs.

6.5.2.1. Electricity

The United Nations Department of Economic and Social Affairs (henceforth UNDESA) argues that the importance of access to electricity in education has not been highlighted. It emphasises that electricity in education needs to be considered as being as important as pedagogy, because it is linked to a number of benefits including ICT facilities, staff retention and training, better school performance, and community development (UNDESA, 2014). In the long run, electricity provision has led to the improvement of education quality in the era of ICT (Barnes et al., 2016). This strong positive relationship between electricity and education can be found particularly in rural areas of Bhutan, Brazil and Bangladesh (Kumar and Rauniyar, 2011; Lipscomb et al., 2013).

In the six schools where I carried out my research however, the interviewees always highlighted electricity outages as the main obstacle that prevented them from using ICT in their teaching practice. This unstable electricity provision frequently happened across the whole school compound, so that both teachers and students believed ICT materials were useless in their context. Nevertheless, the government has consistently pushed its educational policy, which emphasises the value of ICT-integrated ways of teaching without tackling this fundamental obstacle. The World Bank, however, acknowledges that approximately 70 percent of Ethiopia's population lives without electricity (Kitchlu, 2018). Under this circumstance, the gap between ICT beliefs and practices will be maintained, even if schools are better than ordinary households.

6.5.2.2. Antipathy towards Plasma TV use

When teachers were asked about the provision of ICT in school, their answers always started with Plasma TV. Regardless of the nature of the actual utilisation of Plasma TV, the answer of *'we have Plasma'* sounded as if they were proud of it.

What became clear in the interviews and in my research however, was that the majority of teachers simply mentioned Plasma TVs because a Plasma TV was physically in their classroom. In other words, mentioning Plasma TV as a material they had did not reflect the actual implementation of Plasma TV in classes. Of course, personal beliefs would determine whether they used Plasma TV and these might not always result in their utilisation of Plasma TV in their teaching. Below are two reasons for this discrepancy (Mama and Hennessy, 2013). First of all, teachers indicated a frequent failure in the system, which to some extent included access to electricity. However, system failure was primarily related to an intrinsic Plasma TV failure. When they experienced the system failure, there was no one who could repair the system, including the ICT technician. To receive maintenance, the school had to contact the provider, which were usually Chinese companies, and wait for their visit. Teachers believed that this visit almost never happened (see sections 6.4.1.2 and 6.4.2.2). In these circumstances, teachers could not implement Plasma TV in their lessons, even if they had positive beliefs about Plasma TV use. This does not mean that the first-order barriers had more influence over their ICT practices than the second-order barriers, but means that the first-order barriers could have an impact on the teachers' beliefs. For instance, when the system failure kept reoccurring, their perceptions would be affected and they would start to lose their aspiration to use ICT in class.

At the same time, teachers did not only criticise the system failure but also their PGDT programme. Firstly, they said that they did not receive any Plasma-related training in the PGDT so that they did not know how to operate the system. Most of the teachers only had the opportunity to practise using Plasma TVs once they had started work. This inexperience was particularly apparent when the system did not work. They realised that their incompetency, which should have been resolved through training, led them to believe that they were not able to use Plasma TV. As a result, what they decided to do was close the Plasma cabinet and use chalk instead. Secondly, teachers argued that the content of Plasma impeded its practice in the classroom. In particular, most teachers indicated that the pace of explanations made it more difficult for students to understand. This pace reduced the quality of education because students could not follow the content. Teacher E, who was part of the content producer team in Kokebe Tishba said:

> Fortunately, I was one of the producers of the Plasma distribution.
> What I feel about the problem was that the readers (Plasma teachers)

are not following proper pace for students and they do not have a good accent (because their English is different). The latest version, was not well designed. The diagram was simply copied from the textbook and figures were not attractive. (teacher E)

However, in Menelik II, the vice-principal said that students were supposed to report whether teachers used Plasma to the administrative office. As a result, they just followed this fast flow of teaching by the Plasma teacher. This enforced monitoring and implementation removed teachers' autonomous pedagogy, and made them feel demoralised about using of Plasma TV and negatively affected their beliefs about it.

6.5.2.3. Computer shortage and malfunction

The number of Plasma TVs was not an issue because every classroom had a Plasma TV. Even if teachers faced frequent Plasma system failure, having the physical Plasma material inside the classroom meant teachers could relax a bit in the face of the pressure from the government.

On the contrary, when it comes to computer access for teachers, almost all teachers felt that schools did not consider them as important for students and they highlighted two major reasons for this: 1) numbers of computers; 2) malfunction of computers.

Firstly, teachers argued that most of the computers in the schools were not for them but for the students. Indeed in some schools teachers were not allowed to use computers which were not in use after the class. Most of the schools provided only one computer for each department which was shared by almost 15 teachers. Two schools, Dej Balcha and Menelik II, provided one more laptop for each department, but the head of department obtained the exclusive use of this laptop. Hence, the other teachers did not benefit from use of this laptop, and the level of ICT practices remained the same. Nonetheless, the government has been expanding the use of ICT from just Plasma TVs to computers by 2020 (MOE, 2015). Despite government policy, in reality, computer shortages have made teachers more passive and limited users of computers. For example, teachers use a department computer primarily for administrative purposes, such as typing up exam papers. The typing requires basic ICT skills, so that a few ICT competent teachers sometimes take on all the typing responsibilities (see section 6.4.2.2: volunteer teacher). Most of the ICT competent teachers I met were young and handing ICT-related tasks to ICT competent teachers reduced the spread of ICT practices. In the end, ICT did not meet the governments' expectation of ICT's role in teaching and learning purposes because teachers no longer perceived computers as a practicable ICT resource in their context.

Secondly, computer malfunction influenced teachers' beliefs which discouraged ICT practices. Department computers were out-dated in terms of both hardware and software, and depending on the school, the Internet was either weak or not connected. For this reason, teachers were not able to fully utilise computers for teaching purposes. Teachers said that it was difficult to search for up-to-date information with the current computers meaning they could not provide further information to aid students' understanding. In other words, having materials would not guarantee ICT practices unless they functioned well.

Furthermore, this malfunction issue was not confined to department computers, but also affected newly equipped computers in the lab. Most of the ICT practices with computers usually took place in the lab because there was no alternative access in the schools. Recently installed computers in the lab were slightly different from normal desktop computers. These were thin clients, which required a stable server and network to run the system, provided by Huawei. A thin client is normally much cheaper to install than a normal desktop computer, because it does not have a hard drive that saves the data (the thin client saves data in the central server). In other words, it would easily become a useless item when either the server or network did not work. As mentioned earlier, electricity and systems frequently failed across whole school compounds, which inevitably affected the functioning of thin clients (see 6.4.2.5). Above all, in general, none of the teachers I met actually understood what a thin client was and how it works. Both the lack of understanding from teachers and poor electricity provision meant a foreign adviser from KOICA-NIPA kept insisting that using thin clients was not a suitable option in the Ethiopian context (this is discussed further in the next chapter). Although thin client could have had advantages in Ethiopian context, challenges with functionality resulted in more negative attitudes towards computers, and made people doubt the practicality of computers.

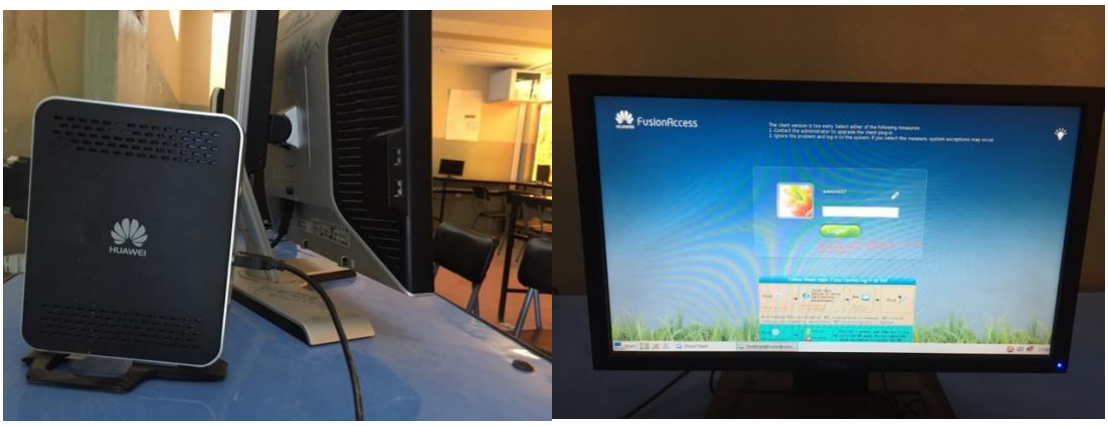


Figure 6.23 Thin client and log-in page in Dej Balcha

6.5.2.4.*Chinese* ICT materials

There was a clear general prejudice against Chinese products. When I had a conversation with colleagues or taxi drivers, they considered Chinese products to be even poorer than Ethiopian products. They preferred Apple or Samsung to Huawei or Techno because they thought Chinese ICT materials possessed a *copycat* image. Interestingly, people in Ethiopia do not believe that Apple and Samsung ICT materials such as desktops, laptops, and mobile phones which are available to buy in Ethiopia are genuine Apple and Samsung products. Indeed, people told me that they believed the chips in the products were exchanged for Chinese ones. This is why most businessmen bought their mobile phones or other ICT materials outside Ethiopia. It is difficult for ordinary Ethiopian citizens to travel abroad, so they inevitably used Chinese products, but did so with an element of doubt.

In the same vein, teachers and students also described the Chinese products as *fake, not authentic, unreliable (see section 6.4.2.1).* Computers and network service providers were oligopolistic primarily by Chinese companies, ZTE and Huawei. Hence, there was no other way to implement or try other companies' ICT materials in schools. The perception that Chinese products were fake or unreliable made teachers and students simply believe that the reason why Plasma TV systems or computers failed to work was because they were Chinese products. For instance maintenance and procurement issues were often raised by interviewees. The ZTE generator was not working for about six months at Bole (see section 6.3.2). This mistrust of products extended to an overall mistrust of the entire ICT-related education projects associated with the Chinese companies. Nonetheless, it would also be important to listen to what Chinese companies think and plan to do in the Ethiopian context. This will be discussed further in the next chapter.

6.6. Conclusion

To investigate ICT practices in teaching, this chapter has explored Ertmer's second-order barriers, which are teachers' beliefs or values with regards to ICT in six schools in Addis Ababa. As mentioned above, there have been many studies that have investigated the impact of teachers' beliefs towards ICT for their practical usage in teaching. However, no studies have considered the situation in an Ethiopian context, despite the fact that Ethiopia is a country which has made ICT-related programs, such as the Plasma TV program, a flagship element of their education policies. I found that teachers' both general and pedagogical beliefs were positive towards the adoption of ICT in teaching. The following quotation (from teacher B at Addis Keteme) shows how teachers regard ICT as an important enabler, not only in current Ethiopian society, but also in the Ethiopian education system.

> If someone does not want to use ICT, he will not be a participant,
> will just lose everything. (teacher B)

Nonetheless, their actual rationale for implementing ICT was not only, or perhaps not mainly, for pedagogical objectives related to students' learning. It was also for personal reasons, including the ability to secure a part-time job, as well for the need to respond to pressure imposed by the government. At the same time, the use of ICT in their society was associated with belonging to a higher social class and with having higher intellectual abilities. Moreover, some teachers had a sense of inferiority towards Plasma TV teachers because they simply admitted that Plasma teachers were better at teaching. Having less self-efficacy towards their own way of teaching is not constructive, regardless of ICT availability. This was why teachers could not connect their pedagogical design with their ICT and teaching practices. Instead of designing ICT-integrated pedagogy, teachers ultimately ended up using ICT for personal leisure purposes.

In addition to this, this chapter has also looked into first-order barriers, particularly the ways in which ICT-related materials that contain their own societal meaning and value can affect teachers' perceptions. Quantity, quality and reliability of materials is not satisfactory so that 'system malfunctions' become a common everyday experience in ICT teaching. It is hoped that the improvements in this area promised by the Ethiopian government will occur soon. In addition, Chinese companies, which are the major providers of ICT infrastructure, are not seen as fully reliable, so that teachers end up feeling wary of ICT systems. As a result, malfunctions and unreliability of materials strongly influence teachers' perceptions towards ICT and in turn their ICT practices.

Under these circumstances, what teachers need is an adequate teacher training programme to be delivered at university. Furthermore, they need appropriate material supports to be provided by national and international governmental and non-governmental organisations. When teachers say they lack training, this is not limited to skills training but also includes awareness strengthening. They realise that it is not only a matter of a skills gap but also of enhancing their beliefs, trust and familiarity with the potentials offered by ICT. Often external support is perceived as the only hope for the provision of ICT materials – teachers do not believe that the government can sort out this material shortage, because teachers have been waiting a long time for this issue to be resolved. This situation made the teacher E at Bole reach out to the international NGO and receive 16 laptops for the school (see subsection 6.4.2.2).

Since 2004, the Ethiopian government has launched Plasma TV instruction as a part of the SchoolNet initiative, which has been extended to the setting up of computer labs and clouding systems (Kim and Bogale, 2014). Alongside this national project, the government is running a series of GEQIPs which are primarily funded by the World Bank, and which include time spent on ICT and education (World Bank, 2008; 2013; 2017). As ICT-related projects require financial support, international organisations, donor agencies and Chinese companies come into the picture as important actors, and often work collaboratively. Although they work together, stakeholders have different priorities and reflections on the current Ethiopian ICT and education. The next chapter will represent how these stakeholders interpret the current situation of ICT-integrated teaching because their interpretation could be more objective than the perspectives of teacher themselves.

CHAPTER 7: Network failure between teachers and ICT practices

7.1. Introduction

This chapter will analyse the Ethiopian network of information and communications technology (ICT) and education, particularly ICT teaching practices in the classroom. It focuses on stakeholders who heavily engage in the network of ICT and education sector. These stakeholders include the Ethiopian government, international organisations, aid agencies, and Chinese companies that initiate and implement policies of ICT and education. Teachers will not be counted as stakeholders, but their ICT practice will be examined as an important outcome of the network. To explore the network failure in Ethiopian ICT practices, this chapter will borrow Latour's (1992) seat belt example discussed in his paper, which describes a strong connectivity between human and non-human. The following is a summarised version of Latour's seat belt example:

> One day Latour was not happy so that he decided to break the law by not buckling his seat belt. After starting his car without buckling the belt, the car first showed the red light with the phrase of *'fasten your seat belt'* then warned him with high pitched and repetitive alarm. Although these made him angry and forced him to fasten the seat belt, he felt relieved after obeying the law. (Latour, 1992)

Latour's example shows that the seat belt, red flashing light, and alarm sound (non-human) have inherent values, duties, and even ethics. Hence, these force him (human) to buckle the seat belt, following the expectation from the car, law, and police, even though he had wished to break the law. Therefore, a strong connection between every actant is made and the network does not leave much room for non-compliance.

However, when it comes to the Ethiopian context, although a driver (teacher) barely recognises a dim red flashing light warning him to wear a seat belt, there is no high pitched and repetitive alarm sound (warning signals from stakeholders). There is no continuing sound which disturbs the driver and makes him/her buckle the belt (ICT) in order to stop the unpleasant sound. Transferring this logic to the teaching context, this links to teachers who feel no inconvenience (no alarming sound) when ignoring ICT implementation in their teaching. In addition to being fine without the belt, the driver (teacher) does not have enough strength (ICT competency) to pull down the seat belt (ICT) so that the driver and seat belt cannot be connected. Under this circumstance, the car (ICT and education) is moving fast even if the driver does not know how to buckle the seat belt. As a result, the driver is getting more familiar with driving (or sitting in the car) without the belt, even if he may not be at peace with not obeying the law. When the driver occasionally realises that he is driving (or sitting in the car) without the belt, or he is not strong enough to buckle the belt, the driver may temporarily look for others' help.

In short, the key difference between Latour's example and the case of Ethiopia is that Ethiopia has multiple potential sources of network failure. This research identifies an array of warning signals that show the fragility of the ICT network for different stakeholders in Ethiopia. Based on insights from the aforementioned organisations which identified those warning signals, this chapter will diagnose possible causes of network failure in the Ethiopian context.

This chapter will start with the presentation of two themes, namely signal and interpretation, in section 7.2. Section 7.3 will classify the stakeholders into three groups: 1) national government (federal and regional); 2) international organisations including aid agencies; 3) Chinese companies; and briefly explain their commitment to ICT and education. Section 7.4 comprises two sub-sections based on separate themes and presents the signals stakeholders have found in the broken network, and how they have interpreted this disconnection. Section 7.5 will analyse stakeholders' interpretations to diagnose the broken nodes of the network which lead to less ICT-integrated teaching.

7.2. Thematic Framework

7.2.1. Signal

As Latour's example described, a red flashing light and alarm sounds are representative signals which warn the driver that *something is going wrong*. These signals are technologies that contain the value, which is supposed to be followed by the driver. Although technologies are designed by humans, socio-cultural characteristics influence the design process of technologies, which in turn reflect the values of society. In Latour's case, buckling the seat belt is the value of society which influences the driver, despite the fact that he intentionally wanted to break the law. The signals turn his unlawful intention back to the ethical behaviour which strengthens the loosened network.

This represents how signals play an important role in preventing network failure between human and non-human. In the Ethiopian ICT context, signals are frequently found and warn of network failure, not only to teachers who have the "driver" position, but also to stakeholders that engage in ICT and education. However, these signals often cannot be heard, resulting in an unstable and broken network. To diagnose the current ICT practices in teaching, this chapter will investigate multiple sources of signals identified by stakeholders.

7.2.2. Interpretation

Although finding signals is the first step to realise missing connections within the network, knowing how to interpret the signals is the next crucial step to fix this network disconnection. In Latour's example, the driver finds and interprets the signals which make him change his behaviour and return to the network. However, another driver who does not react to the same signals might not buckle the seat belt. In other words, not being affected by the signals means that this driver may not acknowledge and interpret them as same as the former driver. In consequence, the latter driver will not return to the network, which thereby becomes unstable and loosened.

When it comes to the Ethiopian context, although teachers are the main drivers for ICT practices in teaching, stakeholders in the ICT and education sector are like engineering team members who work in the pits. When stakeholders find the signals, they primarily interpret them in their own ways. However, following this individual interpretation, there is no consensus process which connects the relationship among stakeholders and no cohesive signal interpretation is given to the driver. Under this circumstance, this chapter will introduce different interpretations from stakeholders with regard to Ethiopian ICT-integrated teaching in the classroom.

7.3. Stakeholders

Ethiopia was under the Marxist dictatorship led by Mengistu Haile Mariam which ended in May, 1991 (Twibell, 1999). In a new constitution article 1, Ethiopia declared that it is a democratic country with a federal system (FDRE, 1994). However, it has been dominated by one political party and could still be seen as an authoritarian state in global democratic standards (Horne, 2019; Freedom House, 2020).

Traditionally, establishing a democratic government has been considered a top priority, since this is a common political requirement to receive foreign aid from the international community, especially Western donors (Crawford, 2001). The Ethiopian case illustrates this dynamic: aid dried up during the dictator regime, but Ethiopia started to receive affluent aid since the early 1990s (Dagne, 2006). Nowadays, Ethiopia is placed within the top 10 aid recipient countries and occupies the first place among African countries, according to the most recent OECD statistics (see table 7.1).

		2015	2016	2017	**3-year average**	% of all recipients
1	Ethiopia	3 235	4 074	4 117	**3 809**	7%
2	Nigeria	2 432	2 498	3 359	**2 763**	5%
3	Tanzania	2 582	2 318	2 584	**2 495**	5%
4	Kenya	2 464	2 188	2 475	**2 376**	5%
5	Democratic Republic of the Congo	2 599	2 102	2 280	**2 327**	5%
6	South Sudan	1 675	1 587	2 183	**1 815**	4%
7	Uganda	1 628	1 757	2 008	**1 798**	4%
8	Morocco	1 481	1 992	1 885	**1 786**	3%
9	Mozambique	1 815	1 529	1 776	**1 707**	3%
10	Egypt	2 499	2 130	-114	**1 505**	3%
	Other recipients	28 643	27 733	30 247	**28 874**	56%
	Total ODA recipients	**51 055**	**49 908**	**52 800**	**51 254**	**100%**

Table 7.1 Top 10 net ODA receipts in Africa from all donors, in million USD.
Source: OECD (2019)

In the current international landscape, democratisation is not necessarily the main priority, as other global political interests such as trade, security, climate, and energy become more important, depending on the countries. In addition, the traditional role definition and relationship between donor and recipient have changed, due to the emergence of non-Western donors. Non-Western donors, representatively China, do not set a high standard of conditionality for providing aid, which leaves recipient countries more choice of action.

Based on an understanding of this changed landscape, this section will introduce stakeholders who have a connection with the field of ICT and education. The section will furthermore describe their roles in this field, and why they have been selected as influential actors.

7.3.1. Ethiopian government

7.3.1.1. Centre for Educational Information Communication Technology (CEICT)

Under the Ministry of Education (MOE), the Centre for Educational Information Communication Technology (CEICT) is in charge of any instructional technology-related educational policies and their implementation. The initial ICT implementation in Ethiopian education goes back to the 1950s and started with a radio programme for students in remote areas, funded by USAID (Damtew, 2005). With the same purpose, Plasma TV has been introduced to secondary education, while radio is still used for primary education. Although the centre belongs to the MOE, it has independent authority when it comes to decision making processes. Currently, the centre is in the process of splitting off from the MOE and being assigned a bigger budget, as the federal government continues to enlarge the ICT integration in education.

The centre plays the core role in Ethiopian instructional technology, it has been transmitting the Plasma contents across the country, particularly to schools which are not yet digitised (see figure 7.1). The contents are recorded on a small videotape and three officers are in charge of Plasma transmission. On the basis of a broadcasting timetable, these officers manually control the transmission players which are assigned to broadcast different channels.

Figure 7.1 Plasma content transmission in the CEICT

However, according to one member of staff, the production of the transmission player is discontinued, including its spare parts. Hence, to purchase spare parts, he recently had to travel to India, the only country still selling the player. This maintenance difficulty in relation to the transmission player will be one of the major reasons of the Plasma contents digitisation. This is why it is important to investigate how CEICT will overcome the current challenges with improved collaborative work connecting the teacher training to the actual ICT utilisation.

7.3.1.2. Ministry of Communication and Information Technology (MCIT)

The Ethiopian government established the Ministry of Communication and Information Technology (MCIT) in 2010 when the government strategically established ICT as a key priority. Today, the Ministry is in charge of the overall ICT strategy, policy design and implementation (FDRE, 2016; MFED, 2010). The year 2010 overlaps with the time when GTP was launched. Within GTP, ICT has been considered as key catalyst for national development (MFED, 2010). There are a number of directorates under the MCIT and this research explores three directorates that work closely together with other domestic and international organisations including CEICT: 1) The directorate for capacity building; 2) the directorate for e-government; and 3) the private sector development cooperation directorate. By investigating MCIT, this section will help to understand both current and future government ICT policies, as well as staff ICT training and collaboration management. It will furthermore examine how federal government overarching ICT policies affect ICT implementation inside the classroom.

7.3.1.3. Addis Ababa Education Bureau (AAEB)

The Addis Ababa Education Bureau (AAEB) aims at establishing an effective educational system to make its citizens play a major role in the Ethiopian society (AACG, 2019). Representing the capital city, AAEB has the biggest budget compared to other regional education bureaus, thereby reaching a larger group of project beneficiaries. According to an AAU professor, the federal government had selected only 6 schools to be digitised in Addis Ababa as a pilot project. However, by investing its own budget, AAEB digitised 59 additional schools.

Furthermore, AAEB equipped a monitoring and data centre, which supports the 65 digitised schools across the city (see figure 7.2). Inside the centre, an AAEB ICT technician monitors which computers are in use and how much memory and disk space is being used.

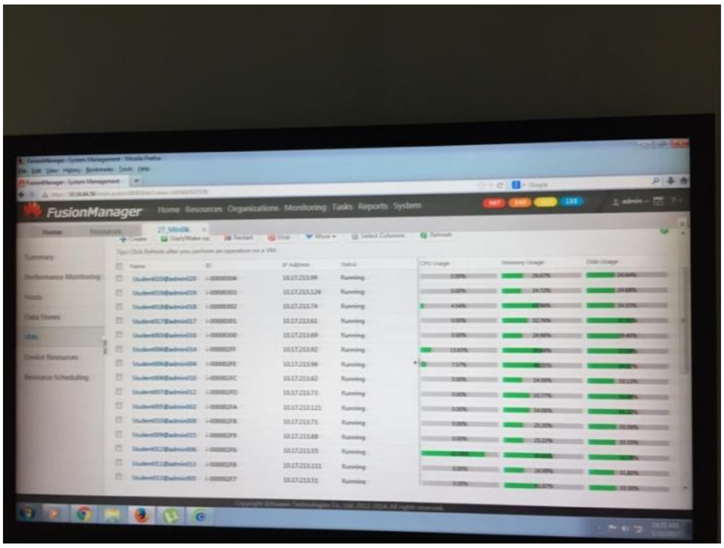


Figure 7.2 Computer lab monitoring system in the AAEB

However, the monitoring system does not allow the technician to manipulate or delete data saved by teachers and students. To fully utilise this monitoring system, AAEB also provides training for both teachers and technicians. However, as found in the chapter 6, it is difficult to observe the actual ICT practices in teaching. As a result, the further exploration into AAEB will identify its commitment to enhance the practical use of ICT exclusively in Addis Ababa secondary schools.

7.3.2. International organisations and donor countries

7.3.2.1. World Bank

The World Bank has taken the lead of an education programme with DPs called GEQIP since 2008 (World Bank, 2008). Although the first phase of this programme did not directly cover the field of ICT, the second phase (from 2013/2014 to 2016/2017) established a separate budget for ICT and education (World Bank, 2013). As GEQIP's main funder, the World Bank facilitates and discusses the division of work among DPs. In addition, it decides the allocation of budget for the next phase of the programme. Although the World Bank and the DPs are not directly designing educational policies, they have the authority to either increase or reduce the budget for a certain area, based on their monitoring and assessment report. In other words, the Ethiopian government is not able to continue following its strategic priorities if the outcome does not meet the target. This is what happened to the budget of ICT and education which was reduced from GEQIP-E (World Bank, 2017). As mentioned earlier, this field requires sufficient budget to complete the on-going policies. However, once the budget is cut by the major funder, Ethiopia's long-term development plan may be laggard. This shows the decisive influence of the World Bank on both policy implementation and budget of Ethiopian ICT and education.

7.3.2.2. UNESCO-IICBA

UNESCO is one of the DPs which heavily engages with Ethiopian education policies, but is not engaged in the GEQIP. In particular, UNESCO-IICBA (International Institute for Capacity Building in Africa) is located in Addis Ababa, which gives Ethiopia advantages as a host country in terms of receiving more education programme support. IICBA is an exclusive organisation within UNESCO which focuses on building the capacity of African member states to achieve equity and inclusive education (UNESCO-IICBA, 2019b). Its initial step of capacity building is teacher education. To train teachers, UNESCO-IICBA emphasises the benefits of ICT across the African continent and ICT plays the central role to achieve other objectives (see figure 7.3). The organisation operates in the whole Africa, but it provides separate ICT competency training to Ethiopian teachers, due to its location in Addis Ababa.

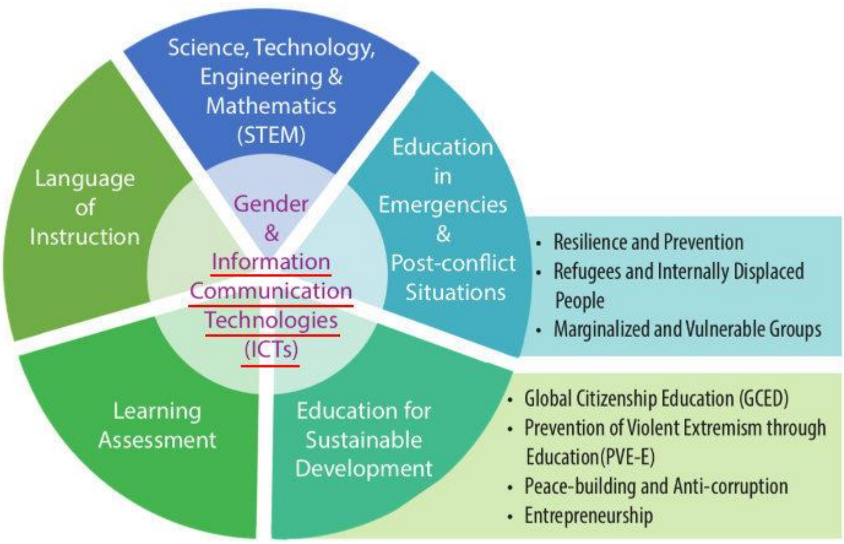


Figure 7.3 Objectives and role of UNESCO-IICBA
Source: What we do (UNESCO-IICBA, 2019b)

For instance, from 27 to 31 May 2019, teacher educators of Hawassa College of Teacher Education held a training workshop funded by UNESCO-China-Funds-in-Trust (CFIT) (UNESCO-IICBA, 2019a). The training aimed at understanding e-learning, e-assessment, and ICT tools to bridge the education quality gap (ibid). This training and engagement represent the commitment of UNESCO-IICBA to developing the Ethiopian ICT-integrated education, which can be expected to be influential for the development trajectory of the ICT and education sector in Ethiopia.

7.3.2.3. USA: United States Agency for International Development (USAID)

According to OECD statistics (OECD, 2020), Ethiopia is ranked third among the top 10 recipient countries from USAID (see figure 7.4). This shows the priority position of Ethiopia for the US government, compared to other developing countries. For the first phase of GEQIP, USAID did not initially participate as a pooled partner[27] but supported GEQIP though their own educational projects; it became a pooled partner from phase II (World Bank, 2008). Although the amount of USAID's GEQIP II fund was not as large as IDA or DFID, USAID provided US$ 11 million to GEQIP II (World Bank, 2017).

In addition to this pooled fund, USAID implements its own educational project called Reading for Ethiopia's Achievement Developed (READ). READ provides textbooks written in the local language and offers professional teacher development to improve the level of literacy, which benefits the development of both individuals and local communities (USAID, 2018). Alongside READ, the US embassy occasionally provides ICT training to female secondary school students, which represents their emphasis on harmonising ICT and education.

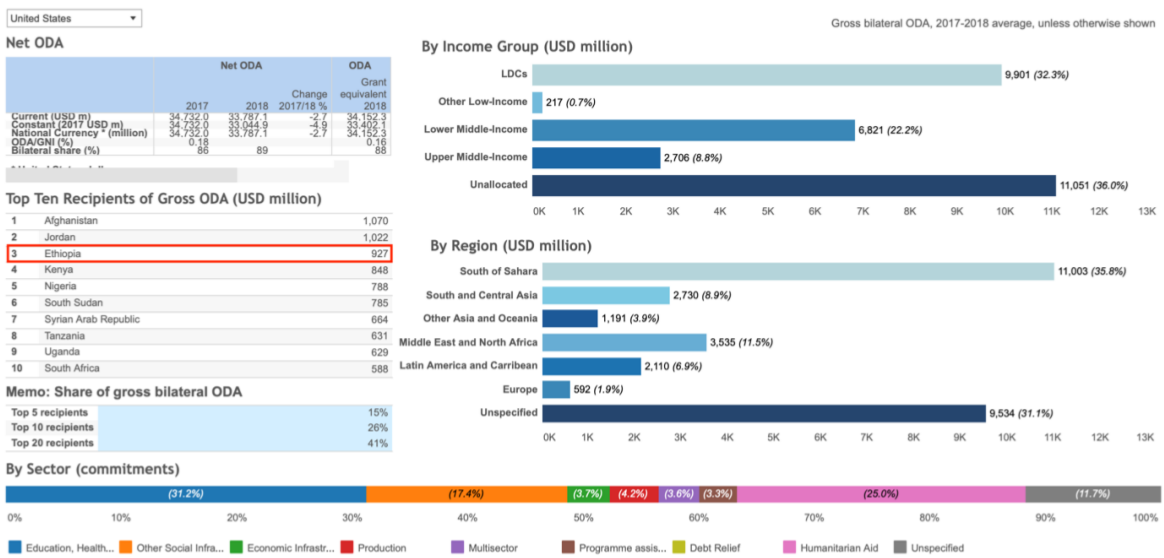


Figure 7.4 Overall outlook on ODA (U.S.A)

Source: Aid at a glance charts (OECD, 2020)

[27]GEQIP is a pooled-funding, which is collaborative budget made by various partners. That is why these partners are called as pooled partners.

As it engages with educational radio programmes since 1950s, the emphasis on ICT and education will continue in the current GEQIP-E. This chapter will identify how the current challenges in the field of ICT and education are interpreted by USAID, and reflect the organisation's role in the Ethiopian context.

7.3.2.4. UK: Department for International Development (DFID)

DFID allocates the second biggest proportion of aid to Ethiopia among top 10 recipients (see figure 7.5). In comparison to USAID, the amount of Net ODA from DFID is approximately half, but USAID and DFID are the top 2 individual donor countries apart from International Development Association (IDA) (see figure 7.6). This was an important reason of selecting these two agencies. When it comes to GEQIP, on the contrary, DFID accounts for the first or the second largest share throughout phase I, II and E (World Bank, 2008; 2013; 2017). The amount of budget invested clearly shows DFID's interests in the Ethiopian education sector, and the interviewee from DFID stated that ICT and education is one of its priority areas, compared to other donor countries. This means that DFID may have an influence when it comes to educational policy design, which in turn may affect the reduced budget of ICT and education in GEQIP-E. Thus, understanding DFID's educational priorities is relevant for the future of Ethiopian ICT and education.

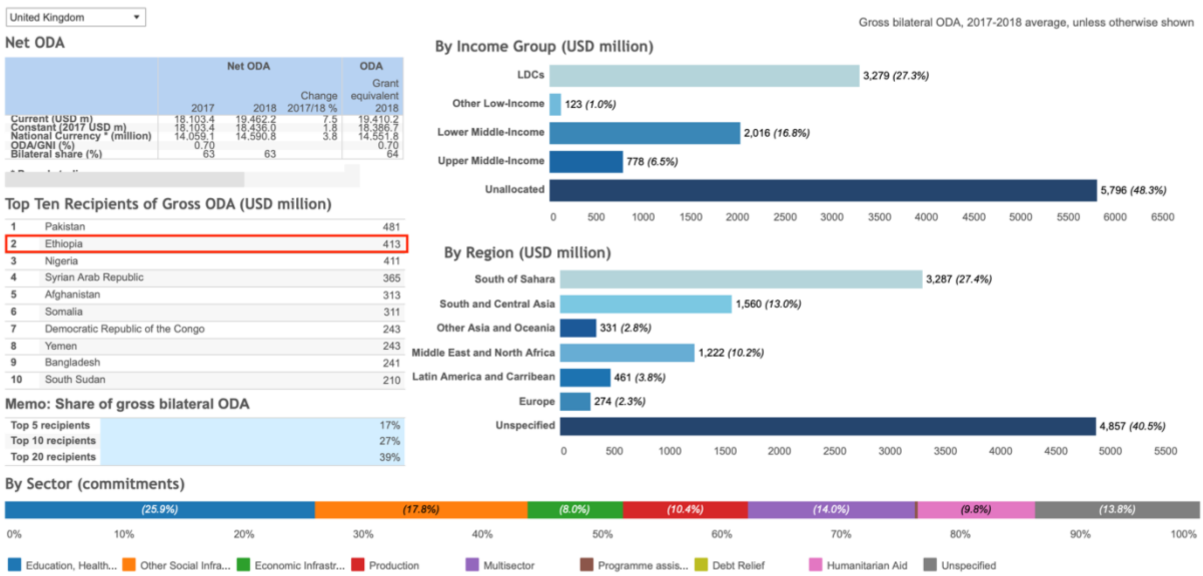
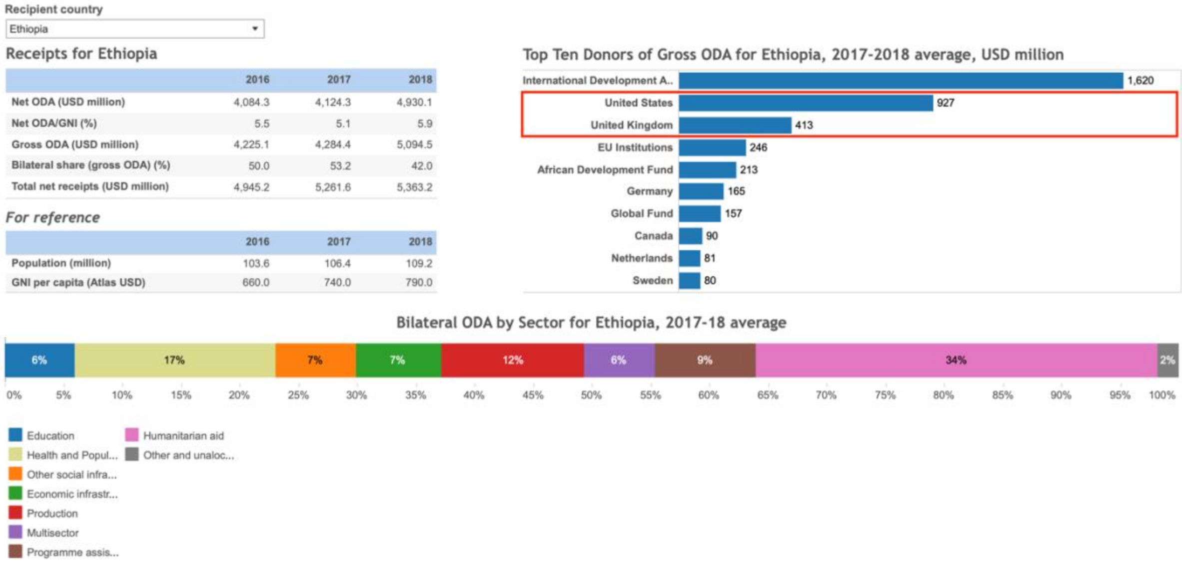


Figure 7.5 Overall outlook on ODA (UK)

Source: Aid at a glance charts (OECD, 2020)



	2016	2017	2018
Net ODA (USD million)	4,084.3	4,124.3	4,930.1
Net ODA/GNI (%)	5.5	5.1	5.9
Gross ODA (USD million)	4,225.1	4,284.4	5,094.5
Bilateral share (gross ODA) (%)	50.0	53.2	42.0
Total net receipts (USD million)	4,945.2	5,261.6	5,363.2

	2016	2017	2018
Population (million)	103.6	106.4	109.2
GNI per capita (Atlas USD)	660.0	740.0	790.0

Figure 7.6 Total ODA for Ethiopia

Source: Aid at a glance charts (OECD, 2020)

7.3.2.5. South Korea: Korea International Cooperation Agency (KOICA)

The aid donations contributed by KOICA represent only 5-10% of those contributed by DFID and USAID (see figure 7.7). However, in the interviews of this study, both the CEICT director and the representative from the MCIT directorate frequently mentioned the Republic of Korea as Ethiopia's role model. In addition, the approach of KOICA tends to be capacity building which costs less than high-priced infrastructure. For example, a Korean professor used to occupy the role of chancellor at the Adama Science and Technology University, one of top universities in Ethiopia. In addition, KOICA-NIPA (National IT Industry Promotion Agency) delegates ICT and education specialists as government advisors in the CEICT. This is how KOICA directly engages with policy initiation in the Ethiopian ICT education sector, rather than joining the pooled funding. This chapter will show its current approach and future strategic plan that is likely to affect Ethiopian ICT and education in the long run.

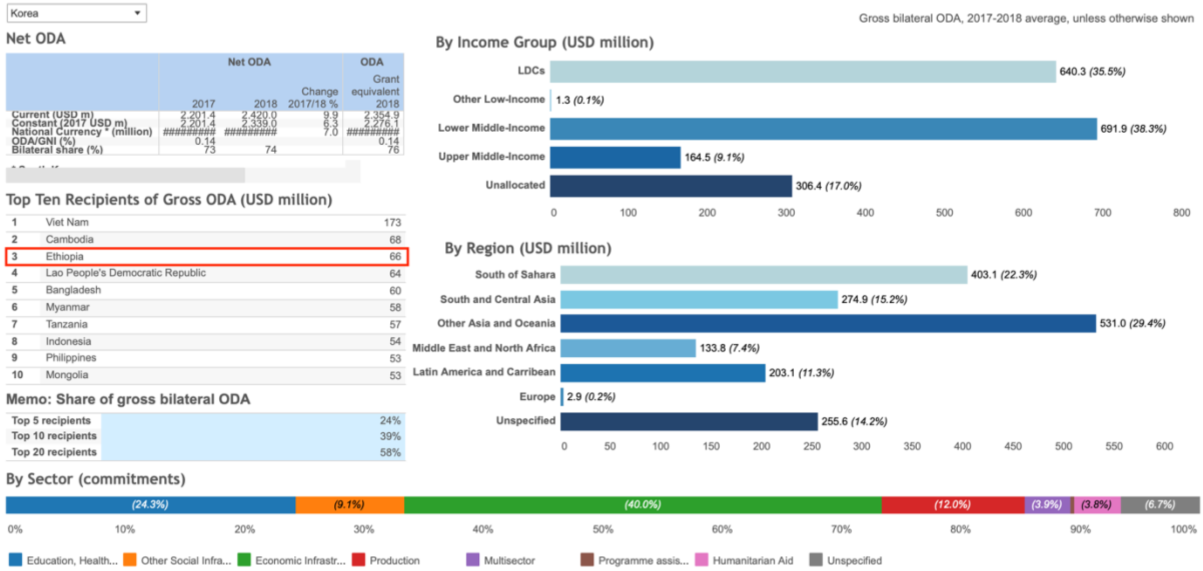


Figure 7.7 Overall outlook on ODA (South Korea)

Source: Aid at a glance charts (OECD, 2020)

7.3.3. Chinese companies: ZTE and Huawei

ZTE and Huawei are currently the major two companies involved in the Ethiopian ICT sector, including ICT-related education. According to a ZTE officer, ZTE is the first network provider in Ethiopia, and its engagement has started in 2000. The major scaling-up investment started from 2007 with an optical fibre transmission backbone project in Ethiopia (Foster et al., 2008; ZTE, 2019). The government received a loan of US $1.5 billion from the Chinese Export-Import (EXIM) Bank and ZTE was in charge of the implementation of the first phase of this project (Adam, 2012). From the second phase in early 2013, Huawei shared the implementation work with ZTE and the EXIM bank provided an additional US $1.6 billion to improve wireless telecommunication (ibid). Since the second phase, both ZTE and Huawei have dominated the provision of network and infrastructure due to their low cost of materials compared to those offered by Western companies (Chang et al., 2009; Dalton, 2014).

Huawei provided all computers for the computer labs of six schools analysed in this research (see chapter 6). This material dominance is not only limited to secondary schools, but also includes regional education bureaus, as the system in each school has to be monitored by Huawei software (see figure 7.2 above). Its material installation is associated with a project called SchoolNet, which will use cloud-computing to access digital learning content saved in the data centre (MOE, 2015; Huawei, 2016). In October 2015, Huawei and AAEB launched the project with a media event in Addis Ababa (Balancing act, 2015).

According to AAEB, the total investment for SchoolNet amounted to US$ 11.5 million (ibid). However, the nationwide project faced challenges in both procurement and contracting, which led to the suspension of SchoolNet until May 2017 (Endeshaw, 2017b). Under this circumstance, teachers and ICT technicians from schools argued that both companies have not been supportive, particularly in maintenance and training aspects. This is illustrated by the example of Bole's generator failure given in the chapter 6. These experiences might build for teachers negative beliefs, not only towards Chinese companies, but also regarding the general use of ICT materials in teaching practice. However, this is perspective from teachers and it is important to listen how ZTE reflects and assesses its own engagement in ICT and education.

Moreover, in the international context, the relationship between the U.S. and China hugely influences the business of ZTE and Huawei, even in Ethiopia. In April 2018, the U.S. imposed sanctions on components from American suppliers for seven years. This measure made ZTE consider discontinuing its business in Ethiopia (Mayeda and King, 2018). Although the U.S. government lifted the sanction, this instable relationship is still not resolved. Huawei is in an even more serious position: The Trump administration pointed to the founder of Huawei's military background and the close relations with the Chinese government as a threat to U.S. national security (BBC, 2019; O'Flaherty, 2019). Consequently, the U.S. government has taken a strategic approach towards Huawei, with measures such as raising a custom tariff and banning government contracts including private sectors (Cuthbertson, 2019; Lohr, 2019). This unstable relationship between the U.S. and China might affect the upcoming schedule of ICT and education project implementation in Ethiopia. If the project cannot be started or completed on schedule, Ethiopian ICT and education budget would be reduced as DPs cut the budget of GEQIP-E.

7.4. Findings

7.4.1. Signal

7.4.1.1. Ethiopian government

7.4.1.1.1. CEICT

Although the CEICT has been in charge of ICT and education for 60 years, Ethiopia is still struggling with ICT implementation alongside its technological development. As technology developed, the centre has been trying to adopt new ICT to be implemented in teaching practice. However, the centre also realised that updating ICT would not be a panacea to improve the quality and equity of education.

To understand the overall picture of CEICT and its collaborative works, a director of the centre and expert on ICT and education was interviewed. He gave the following insights into which types of ICT the Ethiopian government specifically focused on, i.e., which types of "seat belts" teachers are supposed to buckle up.

> ICT herein Ethiopia indicates educational television, Plasma, radio, educational computer instruction and Internet availability. However, at this time, the Internet and computer are replacing the television and radio. Even now, we include smartphones and tablets for emerging regions. (Interview, 8th March, 2017)

While the previous quote illustrates the transition period, the interviewee furthermore mostly focused on the process of digitisation. Plasma will be maintained and transmitted, but the provision of two computer labs in selected schools was a starting point to digitisation, as the following quote shows:

> Computer labs will be installed in all secondary schools. That is our plan and currently 120 secondary schools already have computer labs supported by the central government. The other 300 secondary schools are expected to install computer labs later on. These labs will be connected to a server (data centre) which is going to be installed here at the centre (CEICT). (Interview, 8th March, 2017)

The digitised schools were selected based on the number of schools in each region and proportionally divided. In addition, there were a number of criteria such as road accessibility, Internet connectivity, stable electricity, and availability of rooms for computer installation. Although the interviewed director mentioned that the digitisation was already in process, according to DPs, the Ethiopian government could not even proceed to the procurement stage with the 300 school project (GEQIP II). In a similar manner, the establishment of a data centre was also delayed, in spite of the provider being decided in early 2017.The centre, which manages the whole computing system in every digitised school across the country, was only starting to be set-up in December 2017 (see figure 7.8). Both procurement and data centre set-up delays were signals which took place inside the government and postponed the ICT-integrated teaching. Nonetheless, the director described the decision making and communication channels within the CEICT and beyond the ministries as efficient.

Figure 7.8 The establishment of data centre in the CEICT

From the director’s perspective, three signals were pointed out, which were primarily found outside the government. The first one was the attitude of teachers, as the following quote shows:

> Changing attitude would be very difficult! It means more because it takes more time to change. (Interview, 8th March, 2017)

In line with this perception, he emphasised the need for teacher training (regarding ICT practices and attitudes) as the second signal, given that changing beliefs takes a long time (Yusuf, 2005; Mangiatordi and Pischetola, 2010; Abera, 2013). However, he highlighted the difficulty of integrating ICT into daily teaching and learning processes in pre-service teacher training in university. To tackle this challenge, the CEICT organised a range of workshops, using the 300 selected schools as a centre to practise computer skills and inform about the benefit of using ICT in teaching practices. Thirdly, he indicated the shortage of infrastructure. This is an inevitable challenge when countries are in the initial stage of ICT implementation into education (Peeraer and Van Petegem, 2011; Buabeng-Andoh and Issifu, 2015; Dintoe, 2018). Above all, having ICT materials is a fundamental prerequisite to enhance the degree of ICT utilisation.

The three aforementioned signals found outside of the government would deteriorate teacher's ICT practices. However, the internal inefficiency of the government, which primarily determined the progress of the project, was not appropriately reflected by the director. One reason for not perceiving this signal as relevant might lie in the planned transition of the centre into a separate ministry, which possesses more autonomy in relation to policy design and implementation. At the current stage, the director described the Republic of Korea as a role model which could fix the broken network caused by the mentioned three signals.

> We would like to have Korean experience, specifically in technology.
> This is our plan. Now we are communicating with Korea seriously.
> (Interview, 8th March, 2017)

My Korean nationality as an interviewer might have an influence on those statements; however, the other government official in Ministry of Communication and Information Technology (henceforth MCIT) also frequently mentioned the role of South Korea in this sector. Furthermore, a foreign advisor dispatched by KOICA-NIPA in the centre was another important interviewee (see subsection 7.3.2.5). His assessment was objective, in spite of being part of CEICT staff. He provided a number of critical signals particularly associated with the role of the Ethiopian government and the political influence to ICT and education policies.

7.4.1.1.2. MCIT

ICT was not only emphasised in the educational sector, but also counted as a key enabler in the GTP. Throughout two phases of the GTP, ICT infrastructure was planned to solidify in phase I (2010/11-2014/15) and phase II (2015/16-2019/20) assigns a separate section for ICT such as e-government, e-commerce, e-learning, and mobile banking (MFED, 2010; NPC, 2016).

Within MCIT, three directorates were selected on purpose for prioritised ICT integration: the capacity building directorate will link to teacher education and the other two (e-government and private sector) will cooperate with any ICT-related public and private stakeholders. Although the work of the three directorates is not directly associated with education, general ICT policies and implementation inevitably affect ICT-related educational policies and practices.

According to the director of the capacity building directorate, this directorate supported advanced training for regional and federal ministries and university staff involved in ICT research and development. However, the benefits of this training not always returned to the public institutions and schools because staff regularly left their jobs after training. For example, once staff received training from either the government or one of the aforementioned countries, they often quit their jobs in the public sector and moved to private employers who guaranteed a higher salary.

MCIT found a signal of disconnection here, because trained staff were supposed to transfer what they learned from the training. Above all, university lecturers needed to teach their students, and these students were supposed to transfer their knowledge to students in schools. However, this cycle is broken when lecturers move to the private sector. In addition, the format of training was another signal causing a loosened network of ICT practices. Most training did not take place in Ethiopia, but in other countries, such as South Korea, Japan, India and China. These countries invited the Ethiopian government and university staff and provided a short period of training. ZTE and Huawei were leading agencies to run this training format. The private sector development coordination director argued that this was indispensable due to the Ethiopian domestic ICT environment not being competent enough to provide training. Moreover, there was no alternative option apart from Chinese companies which recently overtook other countries and dominate the Ethiopian public and private ICT markets.

With regard to project or dialogue delay, the e-government director pointed out their own procurement system as a signal. This procurement issue associated with GEQIP II was frequently indicated by other stakeholders (see 7.4.1.2). These delays diminished the momentum of policy implementation, which resulted in a broken network with poor ICT practices in teaching.

In addition to these aspects, all three directors highlighted two more signals which caused a gap between policies and practices in ICT-integrated education. Firstly, an outdated curriculum: the directors accepted that the field of education could be relatively conservative with respect of curriculum change. Secondly, an ill-prepared regulatory and legal framework could make people hesitate to utilise ICT in education and beyond.

7.4.1.1.3. AAEB

As a regional education bureau, AAEB engages much closer with the reality of the current ICT-integrated education in secondary schools of Addis Ababa. As mentioned earlier, apart from GEQIP II, AAEB digitised 65 schools managed by themselves. In other words, AAEB had its own clear plan with 65 schools, not only including ICT installation, but also the implementation of ICT materials in teaching.

To understand the overall performance of digitised schools in Addis Ababa, two officers were interviewed: one teachers' development expert and one ICT technician. They gave accounts of the current teacher training (PGDT) and their ICT practices inside the classroom after training. The interview took place in the ICT monitoring and data centre in AAEB. The environment of the centre was even more advanced than the CEICT. The CEICT data centre, which is currently being established, may have a similar set-up because it is manufactured by the Chinese company (see subsection 7.3.1.3.). The interview focused on 65 digitised schools as a whole. Those schools had two computer labs and Plasma equipment which, in principle, allowed teachers to freely load saved contents from the school server onto Plasma screens.

Two interviewees captured three potential signals which obstruct the connection between teachers and ICT practices. The first signal was the Plasma maintenance and system failure. There was no other way to find the spare parts for Plasma screens in Ethiopia. Due to the absence of spare parts, repairing the Plasma in case of malfunction took a long time. It was the same problem that the CEICT faced in relation to the Plasma transmission player (see 7.3.1.1). As a result, some Plasmas worked, while others did not, even if they were located on the same floor in the Menelik II (see chapter 6).

The second signal was a curriculum of PGDT which did not transfer ICT knowledge into pedagogical knowledge. The interviewed ICT technician recounted that he used to be trained as a physics teacher, but he had no training which combined pedagogy and ICT. In a similar fashion, the teachers' development expert agreed that the current PGDT curriculum would not help teachers' ICT-integrated teaching.

A third signal linked up with Ertmer's second-order barriers, teachers' beliefs and attitude (Ertmer et al., 2012). The teachers' development expert identified the reason why ICT materials would not be implemented in the digitised schools. Although those beliefs could not be found at the surface, both interviewees affirmed that teachers' beliefs could interrupt the functioning of the network. In addition, when teachers are trained based on a static and out-dated curriculum, teacher trainees do not have the chance to reshape their attitudes towards ICT for teaching practices.

7.4.1.2. International organisations and donor countries

7.4.1.2.1. World Bank

The World Bank has led and coordinated the education project GEQIP, which shapes the overall education policy and practices of Ethiopia. Nevertheless, the autonomy and authority of Ethiopian government have been respected while the World Bank and other DPs engaged with the GEQIP. The interview with World Bank representatives was conducted almost at the last stage of the GEQIP II, during the drafting period of the third phase (GEQIP-E). In this regard, the bank could provide its retrospective assessment of GEQIP II and prioritise what to include in GEQIP-E. Two World Bank staff members (a senior education specialist and a senior economist), who are currently GEQIP-E team leaders, were interviewed to discuss signals they found since GEQIP II.

As the main funding and managing organisation, the bank took a broader approach to ICT implementation in education. On the contrary, the Ethiopian government kept insisting on the extension of Plasma instruction, which enlarged the gap between the World Bank and the government.

This divergence of views towards ICT continued from GEQIP I to GEQIP-E. The senior education specialist found a signal which loosened the network between the engineering team. He described it in the following way:

> Although the government wanted to have an ICT component in GEQIP I, that was not possible because the priority for the donors was not ICT. Moreover, in GEQIP II, there is a big ICT component, and this ICT component is not Plasma. It is different. (Interview, 25th July 2017)

Even if the government kept emphasising this ambitious extended plan of Plasma, the GEQIP II ICT component could not progress due to a procurement delay.[28] Even though this procurement delay might seem a minor network failure signal, this broken network caused a ripple effect. As given in chapter 2, GEQIP II was implemented from 2014 to 2018, so that the World Bank would be ready to start the evaluation in 2017. In reality, the procurement did not even start until August 2017. As part of the managing body, both staff members indicated these delays as a major signal for holding off the entire ICT component in GEQIP II. The following quotes show the unexpected challenge caused by this delay.

> The installation will be finished next year. We expected this (completion of installation) two years ago. But the project ends in July 2018, there will be less opportunity to see the functioning.
> (Interview, 25th July 2017)

[28]The e-cloud system procurement for 300 pilot schools process delayed due to the indication of fraud in the legal document submitted by the bid winning firm (DFID, 2017).

> By the end of 2014, all the procurement and installation were supposed to finish. It takes so much time and this has nothing to do with ICT. (Interview, 22nd August 2017)

Under these changed circumstances, the Ethiopian government could not convince the World Bank or DPs that the ICT component of their programme should be enlarged. According to the senior education specialist, additional financing for ICT may be supplemented in GEQIP-E only to monitor the installation and utilisation of ICT in 300 schools.

7.4.1.2.2. UNECSO-IICBA

The fundamental idea of UNESCO-IICBA's capacity building was aligned with Ethiopian national education policies. Both aimed at building the capacity of teachers via ICT, in order to provide quality education.

One ICT in education programme officer was interviewed to understand how UNESCO-IICBA engaged with ICT implementation, particularly in teacher education. He referred to three major documents which guided its training direction; 1) the UNESCO ICT competency framework for teachers; 2) the ICT-enhanced teacher standard for Africa; 3) the Technological Pedagogical Contents Knowledge (TPACK). On the basis of these, UNECSO-IICBA focused on how to train teachers to encourage them to utilise ICT depending on their individual subjects. This approach was widely accepted, but DPs and other organisations (see following sections) focused more on a simple utilisation of ICT in practice.

As UNESCO-IICBA managed the whole of African countries, its projects were designed for all member states and most of the time Ethiopia has been selected as a recipient country. However, the interviewee pointed out a relation with the U.S government as the first signal which made UNESCO-IICBA look for as much as possible outsource finance in order to implement its projects. He described that UNESCO's budget collapsed after the organisation approved Palestine's full membership as a state as the first UN-organisation (UN News, 2011; Marwecki, 2019). As a result, the U.S cut funding to the UNESCO and, more seriously, left the organisation in early 2019 (Waxman, 2017; Marwecki, 2019). Since then, China and South Korea actively filled the finance gap. The UNESCO-CFIT project aimed to enhance teacher education in 10 selected sub-Saharan

African countries[29] through ICT from 2012 (UNESCO, 2019). It targeted both pre-service and in-service professional development with ICT-supported blended training and teacher educators' ICT competencies for better training.

Secondly, the officer reminded every foreign provider to understand and respect the context and culture in Ethiopia because if this point was missing, it leads to the loosened network between teachers and ICT. For instance, the Korea Education & Research Information Service (KERIS) trained almost 100 teacher educators from 36 teacher training colleges across Ethiopia. They invited two to three representative instructors from each college and invited them to Addis Ababa for this training project. The UNSECO-IICBA organised this project along with Korean government and Samsung (Korean company) offered 50 PCs to support this training. However, the officer recommended Samsung laptops instead.

> We told them instead of PC, why don't you provide laptop with the same amount of money. We can move it to anywhere. So, Samsung gave us 35 laptops and five printers. (Interview, 14th December 2016)

If Samsung had provided 50 PCs, they needed to find a venue to install and risk that these materials might remain unused computers in AAU (see chapter 5) after training. It means that their (KERIS and Samsung) commitment possibly would not have ended with the expected outcomes if Samsung kept insisting 50 PCs offer.

In a similar vein, the officer found that teachers' perception, awareness and attitude needed to be considered as context characters which interlink ICT materials and practices. The simple ICT material provision without context understanding would lead to unexpected ICT practices as the following quote shows:

> Even if computers were there they used for writing words or exams.
> In the worst case, when there was even the Internet connectivity,
> everyone is jumping into email and Facebook.
> (Interview, 14th December 2016)

7.4.1.2.3. USAID

According to a USAID education specialist, although USAID has been involved in GEQIP, the major education project has been administered directly by themselves. In

[29] Congo, Côte d'Ivoire, DR Congo, Ethiopia, Liberia, Namibia, Tanzania, Togo, Uganda, and Zambia (UNESCO, 2019)

addition to that, within GEQIP, the main focus of USAID was rather on primary than on secondary education. USAID was not convinced by the on-going ICT and secondary education policies and implementation, particularly with regard to teacher training and Plasma. The education specialist firstly started to criticise the policy itself and reasons why USAID focused on primary education. He argued that ICT education should target the younger generation rather than secondary education students, since a lot more students would benefit from this type of ICT implementation. According to his viewpoint, the current policy rather widens the gap of ICT competency between those students with and without secondary education.

Hence, USAID provided an *ICT package* as one of the components to support primary teacher training in 36 Colleges of Teacher Education (CTE). This ICT package encompassed establishing an *ICT room* with a projector and screen, and providing tablets with teaching content to educators. The ICT package came with the development of a course and curriculum design aiming to improve reading skills of primary school students, which was USAID's priority. In addition to this contribution, in November 2017, USAID supported MOE's multimedia learning content, the *Tsehai Loves Learning,* which was designed for a public television programme (U.S. Embassy in Ethiopia, 2017) (see figure 7.9). A local social enterprise primarily led on the production of the TV programme, with both financial and technical assistance from USAID and the Whiz Kids Workshop[30] (ibid). The content of eight episodes was produced in seven local languages to support the Grade 1-4 reading curriculum. Each episode lasted 10 to 15 minutes and contained social values and skills such as respect, honesty, thoughtfulness and social diversity. The major aim of this programme was that while children watched, they obtained implicit reading and writing abilities. In parallel with this, USAID also supported public service announcements (PSAs) which were delivered via local and national radio stations. The PSAs aimed at encouraging a reading culture and corresponding habits within the households.

Figure 7.9 A scene of the Tsehai Loves Learning programme

[30]This is a social enterprise in Ethiopia.

At the same time, the USAID representative pointed out the inconsistency between the secondary teacher training and the reality in the classroom. This inconsistency could be an evident signal which broke the network of ICT practices in the classroom. However, Plasma was still a compulsory teaching method within this broken network, which is why it could not be properly used for teaching. However, more seriously, the interviewee indicated two further potential signals for network failure of ICT and education related to Plasma teaching itself.

Although the Ethiopian government insisted on the expansion of Plasma, the USAID education specialist saw Plasma teaching itself as a signal for breaking the network of ICT and education. The last signal related to the Ethiopian government's monopolisation of the telecommunication sector which does not allow for competitors in terms of services and price.

7.4.1.2.4. DFID

As mentioned earlier, DFID has heavily engaged in GEQIP since the phase I. According to a DFID educational advisor, DFID contributed about 35% to GEQIP II, which is equivalent to US $185.5 million. In comparison to USAID, DFID has taken an active engagement in relation to ICT and education, particularly secondary education. According to the interviewed DFID advisor, DFID allocated US $33.17 millions of its total budget to ICT and US $26 million were already committed as of April 2017. The interviewee pointed out three signals which interrupt the progress of integrating ICT practice in teaching. Firstly, DFID found that there was no baseline survey data to understand the current Ethiopian secondary school teachers' knowledge and capacity in ICT. Hence, DFID has been conducting the baseline survey, with CEICT primarily developing the concept note and survey tool (DFID, 2017). The advisor explained as follows:

> (After the survey), we will know what level of knowledge and capacity exists in the secondary schools across the country…so far data has been collected from 133 schools out of 300. The rest of 167 will be reached very soon. (Interview, August 22nd 2017)

Although the DFID representative announced the rest of the surveys would be finalised soon, the process of this baseline survey was eventually suspended. The reason for this suspension will be discussed in subsection 7.4.2.2.5, based on additional information obtained from the KOICA-NIPA advisor.

Secondly, DFID was not satisfied with the practicality of the current teacher training curriculum. To change this, the British Council implemented the Quality Education Strategic Support Programme (QESSP) between 2014 and 2019 (British Council, 2019). In particular, this programme aimed to improve the ICT competency of teachers, given that both teachers and principals were not competent to utilise ICT. The CEICT was also involved in the design of this policy, called *ICT policy framework for teachers*. This framework initiation represents the continuity of DFID's priority toward capacity building for teachers, from the baseline survey to the policy framework. When it comes to practicality, it included Plasma instruction practices. Although DFID evaluated Plasma instruction more positively than USAID, DFID still pointed out that Plasma instruction needed to be use more effectively. As a result, DFID believed that students would not gain a substantial benefit from Plasma-based teaching.

Thirdly, DFID shed light on the importance of teachers' attitude and awareness towards ICT.

7.4.1.2.5. KOICA

The major contribution of KOICA to Ethiopian ICT and education was capacity building. According to KOICA staff (the former and current deputy directors of the Ethiopia office), when Adama Science and Technology University requested ICT materials, KOICA made their provision conditional upon the delivery of a corresponding capacity building programme. As a result, KOICA established an e-learning centre at the university and provided both system and content development training for their staff. The Ethiopian government was satisfied with this KOICA e-learning centre and planned to replicate this centre to other universities.

Although the project was successful, in the end, the current deputy director found two signals which complicated its implementation. Firstly, there was a procurement delay, which was the same case as for GEQIP II, caused by the geographical disadvantage of being a landlocked country so that took a longer and unreliable customs process.
Secondly, KOICA was not able to invite Ethiopian trainees to Korea, even if the training required a technologically advanced environment (see subsection 7.4.2.2.5). This issue occurred because of previous trainees seeking political asylum due to the unstable political structure. Since then, KOICA shifted its focus to dispatching experts to Ethiopia and train Ethiopians inside their own territory.

In addition, the interviewed KOICA-NIPA advisor in the CEICT mentioned a number of additional signals which could only be found by an insider. The interviewee worked as a foreign advisor since 2016 and planned to stay until 2018. The information obtained through this interview shows that the policy implementation of ICT and education was like a *black box* whose content is only visible for those inside the box. The first signal was that political instability and, consequently, a state of emergency terminated the baseline survey previously mentioned by the DFID advisor (see section 7.4.1.2.4).

The second signal was the Chinese monopolisation process of the ICT and education market. Since the KOICA-NIPA advisor started his job, Chinese companies won every single ICT-related bid except the establishment of the e-learning centre at Adama University by KOICA. According to his observation, no other companies, particularly no Western ones, would have the chance to win a bid against Chinese contenders. For instance, the GEQIP II ICT materials bid was awarded to the Inspur Group (a Chinese telecommunication company) in 2015, at a total cost of US $20 million. However, the Ethiopian government cancelled the award after finding a false document submission by the Inspur Group (Endeshaw, 2017a). After this cancellation, the other two main contenders for the GEQIP II project were again Chinese companies, namely ZTE and Anhui. The data centre, which was then under construction, was also built by a Chinese company. The Chinese domination of ICT materials in Ethiopia would not be an issue if the quality of materials were good enough. However, from the foreign advisor's perspective, the quality of both hardware and software did not reach an appropriate standard.

The third signal was derived from the selection process of digitised schools. The interviewee gave an insight into what was happening outside of Addis Ababa, but still in digitised schools.

> The CEICT simply transmits the content without considering students' understanding. Most students could not understand the content, but should listen to the next one when Plasma is broadcasted. Then, the teacher also finishes teaching after 20 minutes of CEICT transmission.
> The government seems to be satisfied because they teach in English and via technology. (Interview, 14th August 2017)

Aggravating this situation, some schools had lost their speakers, so that students could only watch the Plasma without sound. These were the main issues making the advisor doubt the selection process of digitised schools.

7.4.1.3. Chinese companies

7.4.1.3.1. ZTE

It was difficult to meet ZTE staff because the company blocked any potential confidentiality leaks. In order to meet ZTE employees, I purposely frequently visited the café located in the same building of ZTE Ethiopia. I made one friend, but it took around six months to conduct an interview with him.

He spent almost five years in ZTE Ethiopia and was in charge of a Plasma-related education project. This project started in 2014 and was completed in 2015. It aimed to install an independent server in each school, which contained Plasma learning content. This allowed 120 schools (selected before GEQIP II) to access any Plasma content whenever they want, regardless of the Internet connection.

According to the ZTE interviewee, the final objective of the project was connecting all secondary schools within a single network, so that all schools could access the learning resources saved in the central data centre. ZTE already completed a similar project called the Ethiopian Educational and Research Network (henceforth EthERNet) for tertiary education. The firm built a data centre in Addis Ababa and connected 36 universities with a stable wired Internet network. That was why the interviewed ZTE representative had recommended to the MOE and CEICT to build a data centre in Addis Ababa, for the future connection among secondary schools. Even though another Chinese company, CCC, is now installing this data centre in the CEICT, the initial dialogue was initiated by ZTE.

While the interviewee managed the Plasma project, he identified two signals that loosened the network of ICT-integrated teaching in the classroom. First of all, he pointed out ill-equipped school environment. The environment, he indicated, needed to be ready with: road accessibility, Internet connectivity, stable electricity, and availability of rooms for computer installation for digitised school (see 7.4.1.1.1). For instance, when the project team visited selected schools either to install or maintain ICT materials, frequently the basic infrastructure to progress with the simple installation or maintenance jobs was not in place.

Secondly, the interviewee identified the anxieties of teachers and ICT technicians towards new technology. This represents the teachers' beliefs towards ICT that affect their ICT practices, which was a big obstacle for ZTE's project. Despite finding such signals, ZTE continues a collaborative engagement with the Ethiopian government such as the recent establishment of a joint innovation centre (Ethio Telecom, 2019). The centre aims at catalysing an open and inclusive educational environment for ICT-related research and development (ZTE, 2019).

7.4.1.3.2. Huawei

Although ZTE traditionally dominated the entire ICT sector in Ethiopia, since early 2013, Huawei has roughly half of the market share (see subsection 7.3.3). For example, the main ICT material provider for the GEQIP II was Huawei, which recently had become influential to Ethiopian ICT and education. Due to their aggressive marketing and business strategy, it was even more difficult to meet staff from Huawei than ZTE. There was no café where I could intentionally stay and wait due to the strict security protection for the Huawei building. The only way to contact Huawei was writing emails with patience. It took almost 10 months to receive a reply from the director of education, with whom I finally conducted an interview on 15th December 2017.

The director managed two previous secondary school projects so that he could provide insights into how Huawei proceeded with these projects. The first project was the digitisation of 65 secondary schools in Addis Ababa. The essential part of the digitisation process was similar to the one for SchoolNet, but the budget came directly from the AAEB. As opposed to SchoolNet, the AAEB project was completed without any delay because Huawei managed the whole process from procurement to installation. AAEB's advanced ICT monitoring system was also part of this digitisation. However, the actual ICT practice in the digitised schools did not meet the expectations (see chapter 6). The second project was SchoolNet under the GEQIP II. When informed about the negative reflection toward Huawei from the schools due to poor equipment installation, the director highlighted that the procurement and installation were not done by Huawei, but by another subcontracted Chinese firm. According to his viewpoint, the association with Huawei was likely to derive from the company's name showing on the ICT materials. The delay in implementation seemed to be less important from Huawei's perspective.

While the director managed these two projects, he noticed three signals which broke the network of ICT practices in teaching. The first signal was the limited benefit due to a shortage of ICT materials. This idea led to Huawei's working mechanism of 'thin client' (see chapter 6) that would benefit as many students as possible. This approach is identical to the view of MOE, as mentioned by the KOICA-NIPA (see subsection 7.3.2.5). Secondly, a careless selection of trainees was another signal which made Huawei training inefficient. The third signal was the reckless utilisation of Plasma by teachers. According to the interviewed Huawei representative, the way of using Plasma made teachers rather passive, because they just turned on the Plasma and did not engage with students anymore. For that reason, the utilisation of ICT elements could have unexpected negative impacts on teacher behaviour, thereby not harnessing the full potential of ICT in education.

Regardless of these signals, Huawei promoted their plan to create an ICT academy that provided training. The interviewee repeatedly used the phrase "like Cisco[31]", highlighting that Huawei benchmarks Cisco providing training to its end-users He emphasised the firm's priorities as follows:

> For us, we need to extend the Huawei ICT academy and host a workshop
> for basic training to teachers. This is what we are doing.
> (Interview, 15th December 2017)

Huawei signed an agreement with the Ethiopian government in 2017 to establish this academy on 37 public universities to benefit local education and the ICT sector (Xinhua, 2020). The academy has been training university students who aim to become a teacher in the future. Some top students who were selected by the MOE went to China for two weeks of extra ICT-related training. To establish an ecosystem for ICT development, Huawei held an ICT competition in November 2018 and tried to find local talent both for education and industries (Addis Insight, 2018). In addition to those initiatives, in June 2019 Huawei extended the benefit beyond universities by launching a new project of Technical and Vocational Education and Training (henceforth TVET) college construction (Huawei, 2019).

7.4.2. Interpretation

7.4.2.1. Ethiopian government

7.4.2.1.1. CEICT

The director picked up three signals that did not allow teachers to practise ICT-integrated teaching: 1) teachers' attitude; 2) teacher training; and 3) ICT material shortage. Firstly, the director explained why he thought that the attitude of teachers caused the disconnection of ICT practices within the network. He said:

[31]Cisco "designs, manufactures, and sells Internet Protocol (IP) based networking and other products related to the communications and information technology (IT) and provide services with these products and their use" (Cisco, 2012:1)

> They may think that teachers are much better than technology, so they ignore the technology. They think in that way. This is the attitude problem, and teachers, even if they have their own problems of using technology, do not want to use technology for upgrade. They may have their own way of thinking about materials. (Interview, 8th March, 2017)

In his perspective, the teachers' negative attitude towards technology made them put a limit on their pedagogical improvement via ICT. That led to the interviewee's second signal referring to teacher training. He argued:

> Teachers are not well-trained while they are in institutions and universities. University teachers are expected to train them and prepare their courses to use ICT but training on using ICT is not properly done. (Interview, 8th March, 2017)

One reason for teachers having antipathy towards ICT can be found in the teacher training, which was supposed to construct not only knowledge, but also awareness. The director insisted that if lecturers integrated an appropriate level and materials of ICT in their teaching, teacher trainees would have a different attitude, which in turn would enhance the chance of an increased use of ICT practices in the classroom. The third signal, ICT material shortage, is a fundamental challenge for any developing country, but the Ethiopian government is planning to expand the provision of ICT materials, particularly for the digitisation of the learning environment (see subsection 7.4.2.2.1). However, so far only the 300 digitised pilot schools benefited from this digitisation process. Hence, the director criticised:

> There is a problem of providing infrastructure such as computers, television, television receiver, computer labs, and the Internet. Just some schools get that.(Interview, 8th March, 2017)

7.4.2.1.2. MCIT

The interviewed MCIT directors identified five different signals which disturbed the connection between teachers and ICT practices in the network of ICT implementation: 1) the absence of training receivers (officials or lecturers); 2) the training format; 3) the procurement system; 4) an out-dated curriculum; and 5) an ill-prepared legal framework. As mentioned earlier, the main reason of the trainees' absence was an unsatisfactory salary compared to the private sector. From the government's perspective, it was difficult to offer a salary competitive with the private sector, so this brain drain was inevitable. The eGovernment director regretted:

> Whenever you train them, they will leave you. Public to private.
> The more you build the capacity (the more) will leave. That is the
> most paradox here. (Interview, 5th December 2017)

When it comes to the format of training, officials and lecturers were invited to foreign countries where they received training. According to MCIT directors, this format harmed the whole training process, as well as affecting efficiency because of the time wasted time to travel abroad. Thus, the MCIT eGovernment directorate started conversations with ZTE about the establishment of a training centre in Ethiopia. The eGovernment director said:

> Whenever we need to train our staff, we have to send them to China.
> It is not a good practice. We usually ask Chinese companies to establish a local
> training centre. Actually, they have a plan to invest money to establish
> one in the ICT village. It is in the process, but delayed for a long time.
> (Interview, 5th December 2017)

The logic of establishing a local training centre was to provide training more frequently and guarantee high-quality training. However, the delay in implementing these centres seemed to be common; the other two directors also mentioned ZTE's training centre but commented on the delay as a matter of no importance.

There was another type of delay in procurement, which represents the third signal identified by MCIT staff. Directors interpreted their procurement system as '*lazy with so many breaks*'. In other words, the directors noticed that the broken procurement led to a general disconnection of the ICT practices network, which in turn concluded with a budget cut in GEQIP-E (see 7.4.2.2.1). The fourth signal was related to the unchanged PGDT curriculum, particularly the InsT module. The directors insisted that the current curriculum could not reflect the requirements of classroom teaching, because it was out-dated. The eGovernment director criticised:

> The curriculum is not changing regularly, but the actual situation changes regularly and rapidly. Education is conservative. (Interview, 5th December 2017)

The interviewees highlighted that, while being conservative is not an issue, the curriculum needs to be regularly updated in relation to ICT-integrated teaching, in order to encourage ICT practices. Similarly, directors referred to the legal framework for ICT, which was described as a missing node within the ICT practice network. In their opinion, the clearer the regulatory framework, the more effective outcomes will be encountered. This was how the eGovernment director interpreted the unsatisfactory outcomes from ICT practices compared to the government's investment.

> The legal and regulatory environment is not very clear. So, people are not confident to use ICT. We are trying to draft (related) laws but the enactment or approval process is too long. Some ask why is it still the same in spite of investing a lot of money? It is because we do not have a clear legal environment. (Interview, 5th December 2017)

7.4.2.1.3. AAEB

AAEB officials identified three signals which led to the current loosened network of ICT practices in teaching, even if both national and international governments invested in this field: 1) the maintenance of Plasma equipment; 2) a non-incorporated teacher training curriculum; and 3) teachers' anxiety. Most of the Plasma screens had been used for a long time without replacement. As a consequence, the screen display was not coloured and sometimes the sound was defect. Nonetheless, it was used in its worn-out setting, due to the absence of spare parts for replacement. As one teacher development expert described:

> We are not able to create technology (Plasma) access in every school due to a lack of spare parts for maintaining Plasma screens and other equipment. (Interview, 25th May 2017)

He interpreted that due to the difficulty of finding spare parts the access to and functionality of teaching with Plasma was downgraded, and did not deliver the expected contents with the expected colour and sound (see figure 7.10). As a result, teachers did not use their sole ICT-integrated teaching tool, Plasma, in practice.

Figure 7.10 Out-dated Plasma which was still in use

Two interviewees extended their interpretation of the sources of network disconnection to the PGDT curriculum that did not include ICT implementation in the actual teaching practice. Above all, one ICT technician shared his experience as a prospective physics teacher with the PGDT InsT module as follows:

> I do not think that the university teacher training curriculum integrates with the ICT package. I did not get any training which helps me to integrate the lesson with the technology…They (the teachers) need additional training to scale up their skills in utilising technology. (Interview, 25th May 2017)

A teacher development expert pointed out that teachers simply run Plasma equipment without designing a pedagogical implementation of ICT. He said:

> There is a gap in the teacher training curriculum. Teachers have only the skill of operating Plasma technology. I think teacher training institutes do not incorporate methodologies which help to support the actual technology integration. (Interview, 25th May 2017)

Under this circumstance, teachers were getting anxious when faced with ICT implementation in their lesson. This was because they realised their ICT incompetency due to the non-incorporated training curriculum. Thus, a teacher development expert stated that the teachers' frustration confined the potential of ICT-integrated teaching programmes. An ICT technician supported this view by sharing *“teachers are afraid of technology”*. He added:

> They would feel ashamed in front of their students if they failed to operate the technology properly. Generally, most teachers in most schools avoid utilising technology, as they believe they have no sufficient knowledge in the use of ICT. (Interview, 25th May 2017)

However, teachers do not refrain from using mobile phones outside the classroom. When it comes to simple ICT utilisation, operating Plasma screens would be much easier than using mobile applications, but teachers nevertheless failed to operate the Plasma screens. The interviewed ICT technician interpreted that teachers’ anxiety or frustration made them hesitate to implement ICT in teaching practice, in order to avoid making mistakes. For this same reason, a teachers’ development expert argued *“there should be an awareness creation to teachers in the use of ICT”*.

7.4.2.2. International organisations and donor countries

7.4.2.2.1. World Bank

Two GEQIP-E team leaders found two signals that obstructed the network of ICT implementation particularly within the GEQIP: 1) the opinion gap between the government and the WB towards Plasma; and 2) the procurement delay. The Ethiopian government was proud of Plasma teaching as an advanced teaching method, whilst the WB had a different perspective. For instance, the WB’s senior education specialist argued *”Plasma is kind of one way lecturing from the CEICT”*. This implied that Plasma was not considered an authentic way of ICT-integrated teaching, such as unilateral instruction. The senior economist summed up the broken network between WB and the government as follows:

> Plasma may be just one way, but I just asked the government if that is the only area where they are focusing, because ICT has its own potential. We need to look at little bit more towards a holistic approach in terms of what areas require ICT support, but right now I think the main discussion has just been only about Plasma and Plasma. (Interview, 22nd August 2017)

Under this broken network, the senior education specialist highlighted the need to establish an Ethiopian ICT standard, which related to the bank's final aim of setting up an *Ethiopian-relevant ICT competency framework* (World Bank, 2013). The expert stated:

> What is available, what is the practice of ICT, what is the competency of teachers, and what is the attitude of teachers towards ICT? Establishing a baseline is one of the requirements that has been done by CEICT, but not fully. (Interview, 25th July 2017)

The bank emphasised the importance of having this standard first before expanding the Plasma with another big investment. The senior economist also pointed out:

> ICT is like a complement to the improvement of the education outcome. They (the government) need to firstly identify which areas require ICT support. For that, I think we do not have a consensus yet…we need to have that kind of dialogue first. (Interview, 22nd August 2017)

The second signal, procurement delay, weighed heavily on the two WB officers. This delay exerted a negative influence on GEQIP II because they did not have time to finalise the procurement of the project. As a result, due to this delay, both staff members stressed that the ICT component may be removed in the next phase of GEQIP. The elimination of the component was anticipated because the World Bank expected to see *change and results* rather than more input in the third phase. One senior economist expressed this as follows:

> GEQIP III (named GEQIP-E after interview)will focus a lot more on the result, student learning outcomes. In GEQIP II, we have been focusing on learning conditions rather than learning outcomes… the bank and donors invested, I think, almost one billion over the past 10 years. That is why on the GEQIP III, we are going to focus on learning outcomes. (Interview, 22nd August 2017)

7.4.2.2.2. UNESCO-IICBA

The programme officer representing UNESCO-IICBA clarified three signals that blocked up natural flow in the network of ICT practice: 1) the relation with the U.S government; 2) the context understanding; and 3) the teachers' attitude. As mentioned earlier, the relationship between UNESCO and the U.S. government complicated the implementation of the UNESO-IICBA education project. The project officer stated:

> Recently, the US withholds the support for political reasons. This is not because of Trump being elected, but because the Palestinians were supported by us. UNESCO recognised Palestine as a member. The US Congress some 20 years ago established a regulation or law which states that any agencies or countries that recognise Palestine as a state will not be supported. So, immediately almost 25% of our support was gone. (Interview, 14th December 2016)

To fill the finance gap, UNESCO-IICBA sought to approach DPs or other organisations which would sometimes adhere to their principles. For this reason, the officer thought that the investment in ICT was not efficient enough to achieve UNESCO-IICBA's goal. He argued:

> If you just go and dump and teach ICT, that is a waste of time and money. How do they respond to technology? Because some cultures resist against technology. Are they easily assimilating the new technology? Those factors have to be taken into account as much as possible. (Interview, 14th December 2016)

Nonetheless, the programme officer did see the teachers' attitude (a driver in Latour's analogy) as the main source of the broken network and highlighted that *"It is a matter of attitude".* To change their attitude, he believed that teachers had to have an answer to a question of "why should I change?" His views are reflected in the following quote:

> How can these kinds of attitude be tackled? By showing the best example case study of how teachers benefited by using technology for teaching and learning purposes. Otherwise, immediately immersing teachers into advanced technology would backfire. (Interview, 14th December 2016)

7.4.2.2.3. USAID

The USAID education specialist found four major signals that weakened the cohesion of the ICT practices network: 1) the starting grade of learning ICT as a subject; 2) the inconsistency between teacher training and practice; 3) Plasma teaching; 4) the telecommunication monopoly. As mentioned above, the main priority of USAID was on primary education, where ICT was not a separate subject. Hence, the education specialist pointed out that the exclusion of primary education meant a detachment from the network of ICT and education for primary school students and primary school teachers. He criticised:

> When I see its (MOE's ICT) strategy and policy, it focuses on the secondary and tertiary levels. Look! This is pyramid. The bulk of this bottom is primary and pre-primary. If you do not invest in the foundation, it is wasting money. (Interview, 22nd August 2017)

For this reason, USAID implemented ICT packages in CTEs; they believed it would be the initial step to reconnect the fundamentally broken network between primary and secondary education. The second signal was the gap between teacher training and grassroot level teaching practices with ICT. The teacher is a key element for ICT practices and without adequate teacher training, teachers would not be able to use ICT effectively (Schlager and Fusco, 2003; Lawless and Pellegrino, 2007; Almerich, et al., 2016). The USAID interviewee argued:

> Using ICT and teacher training is totally not existing (in Ethiopian universities), but the MOE is planning to introduce ICT in teaching. They don't yet use ICT in schools (Interview, 22nd August 2017)

In his perspective, the government simply introduced the idea of ICT into policy without full consideration of designing a teacher training curriculum for ICT practices. Further, he argued, problems with teaching were made worse with the implementation of Plasma in teaching, USAID's third signal. The interviewee assessed Plasma-integrated teaching as follows:

> (Plasma is) Obsolete! That technology (Plasma) is not up-to-date and not interactive. It remains in the classroom…do you know the

> name given to their teachers? DJ! Because they just open and close. Interaction between students and teachers is zero. Second, I did not see any result. Is Plasma bringing any changes in learning outcomes? If you go and do a national assessment, students must be very discouraged. (Interview, 22nd August 2017)

In addition, the education specialist took the example of USAID's READ project which demonstrated a positive outcome, compared to the Plasma. He mentioned the unilateral way of teaching with Plasma and had a strong doubt as to whether the Plasma has had a real impact on students' learning outcomes. Unlike USAID's READ project, there was no clear demonstration which showed the positive results of teaching led by Plasma instruction. He assessed that the Ethiopian government was continuously *'dumping the money'* (Interview, August 22nd 2017) to scale up the Plasma equipment.

As the fourth signal, he mentioned the government's telecommunication monopoly as a root cause for the poor ICT and education service. He argued that the quality of telecommunication such as speed and stability has always been an issue, but there is no alternative choice. Under these circumstances, the government kept using the same approach, which was scaling up existing approaches, rather than revising both educational and telecommunication policies. The USAID education specialist compared this to a doctor's prescription, using the following analogy:

> Nobody can provide (a better) service. For example, if you were sick and you got prescription by a doctor, you can go to a private pharmacy or a government hospital pharmacy to buy medicine. You have options. But! For ICT, you do not have options! (Interview, 22nd August 2017)

7.4.2.2.4. DFID

The interviewed educational advisor from DFID found three signals that disconnected the relation between teachers and ICT: 1) having no baseline survey; 2) a lack of practicality within the teacher training curriculum; and 3) the teachers' attitude. As mentioned above in subsection 7.4.1.2.4, the advisor informed about the current state of Ethiopian ICT in education, and highlighted the need to capture this state in a baseline survey. He reflected:

> I think we should acknowledge that we start from a very low baseline

level of ICT infrastructure, availability and service at school level. (For example) the teachers' and leaders' competency of using ICT, as well as their attitude and awareness on the technology itself. (Interview, August 22nd 2017)

It was where DFID found the first signal of a broken network caused by having no clear standard that could guide the direction of ICT development. At the same time, the advisor identified the second signal from the PGDT curriculum. She said:

> Pre-service and in-service training provision to teachers is mostly theory-focused. Of course, the number of hours for practicum has increased over time, but we still need to focus on equipping teachers with the necessary practical skills. (Interview, August 22nd 2017)

This theory-focused curriculum signal was also found by AAEB and MCIT, specifically regarding the out-dated curriculum which does not link up with the practical use of ICT in teaching. The third signal was both the attitude and awareness of teachers towards ICT, which were below the global standard. However, the interviewee acknowledged "Breaking this attitude takes a longer time. (August 22nd 2017)"

She connected the ICT-averse attitude with the teacher training curriculum, which should have considered how teachers' attitudes and beliefs affect the effectiveness of ICT utilisation (Inan and Lowther, 2010; Ottenbreit-Leftwich et al., 2010).

7.4.2.2.5. KOICA

The deputy country officer and KOICA-NIPA advisor classified the potential signals that discouraged teachers' ICT practice into four: 1) procurement delay; 2) political instability; 3) Chinese monopoly; and 4) the school selection process. The first signal, procurement delay, was also frequently mentioned by other DPs (see above). KOICA's procurement delay happened during the implementation of the Adama programme. The deputy officer described it in the following way:

> As Ethiopia is a landlocked country, it took a relatively longer time, because most import products came through the Djibouti port. As KOICA used a vessel to procure the ICT materials, KOICA waited

> for almost 50 days to complete the customs process and left computers and related materials in the port warehouse. (Interview, 2nd December 2016)

50 days of delay did not only affect the programme completion timeline, but also harmed the condition of materials. In addition to this issue, two interviewees emphasised political instability as the second signal. The deputy officer shared the following story:

> In 2013, 39 trainees out of 60 asked for political asylum in Korea one day before the returning day. This training was about Technical and Vocational Education and Training (TVET), but as a consequence, KOICA stopped providing any type of training with Ethiopia.
> (Interview, 2nd December 2016)

All asylum seekers said that they were afraid of going back to Ethiopia because of the current government. As a result of this incident, KOICA and the Ethiopian government are still cautious providing any training format. In the same fashion, the state of emergency stopped the implementation of the baseline survey led by CEICT and DFID. The KOICA-NIPA advisor confirmed why this survey was discarded:

> The state of emergency was the biggest problem. We completed the western and northern parts of the country, but could not even start the southern and eastern side. When we drove with the government car, they just tried to burn the car. The survey cancelled and became never operative. (Interview, 14th August 2017)

Even under the state of emergency, Chinese companies kept expanding their territories in the field of ICT and education. The KOICA-NIPA advisor mentioned a distinctive lobbying approach of the Chinese which could foster their monopolisation. He said:

> When Chinese companies start to make a bid for a certain project, they do not just stay and wait. They are very good at lobbying, but in the Chinese way, *Guānxi*[32]. This is a common way of doing business in China, they simply give money to people. That is why

[32]The term *Guānxi* refers to networks or connections that open doors for new businesses and facilitate deals (Kenton, 2019).

they like Chinese companies. (Interview, 14th August 2017)

In addition, the Chinese companies proposed a competitive price, as well as *Guānxi.* In the end, the Ethiopian ICT and education bid became a competition among Chinese companies. As a result, the standard of both hardware and software were downgraded, in order to win the bid with a more competitive price. For instance, with regard to hardware, KOICA-NIPA advisor suggested the CEICT to install a normal desktop, not a thin client, which needs the Internet connection. However, the CEICT's philosophy of distribution was completely different, as the following quote from the KOICA-NIPA advisor illustrated:

> Their logic was 'If you have 100 birrs, would you give the whole amount to one person, or distribute one birr each to 100 people?" This means that the installation of 40 normal desktops and the provision of decent standard ICT environment would not be a fair idea. Although the standard would be downgraded, providing 80 thin clients and making two computer lab could benefit more students. (Interview, 14th August 2017)

The selection of software followed similar principles. To reduce the price of software, the government chose the Linux operating system, as implemented in the Kotebe Metropolitan University (see chapter 5). The KOICA-NIPA advisor explained:

> Window is the easier and worldwide used operating system. However, It is more costly than Linux. That is why the government chooses Linux even if students are much less familiar with it compared to Windows. As a result, it simply becomes good-for-nothing. (Interview, 14th August 2017)

As a result, both teachers and students were even excluded from the network of ICT practices, due to their unfamiliarity with the provided materials (thin clients and Linux). Despite causing exclusion of teacher and students, what Ethiopian government emphasised was a completion of school digitisation (two computer labs with 80 thin clients per school).

As mentioned 7.4.1.1.1, selection criteria for digitised schools were clearly in place but the interviewed KOICA-NIPA advisor was not convinced by some selected schools in certain regions because the schools neither prepared a server room nor even stable electricity. This led him to the presumption that the influential principal or a political alliance might have affected the selection decision.

7.4.2.3. Chinese companies

7.4.2.3.1. ZTE

The ZTE staff identified three signals, which could disconnect the network of ICT practice in teaching: 1) ill-equipped school environment; 2) temporary training; and 3) teachers' anxiety. With regard to school environment, a supportive infrastructure was supposed to be prepared by the selected schools. However, ZTE could not proceed its project, which in the end limit ICT practices. The interviewee said:

> The road conditions also made maintenance difficult. During the Installation period, we had already sent our materials to the school, but we did not have a proper room for the installation. We had to wait and come back. When they were ready, we went again. Some delays occurred as a result of this. In addition, when we finished the installation, there was no power supply. (Interview, 23rd May 2017)

In addition to the environment, the interviewee recognised that ZTE's short-term training could break the network of teachers' ICT practices. However, in the current circumstances, a week-long training to school staff was the best option, because there was no appropriate venue to provide longer or more frequent training for teachers. To provide efficient training, ZTE rather brought trainees to China, but MCIT directors were not satisfied with this training format (see subsection 7.4.1.1.2). In this regard, the ZTE representative suggested:

> I recommended them to build a training centre for teachers and government officers in Addis. Then, they can come to Addis three or four times a year…I suggested them to put all equipment there and ZTE will provide the training. No problem. They said yes and they are going to plan it. (Interview, 23rd May 2017)

As mentioned earlier, MCIT directors acknowledged the dialogue related to building a training centre but it did not proceed further. According to the ZTE interviewee's viewpoint, this training centre might not have been a priority for the government. Furthermore, he found that teachers were getting increasingly anxious when they faced the situation of using ICT in their lesson, including Plasma equipment. This anxiety stopped them to even try ICT implementation. He said:

> They only see. Not touch. If there are problems, they are afraid to touch the device. So, they keep a distance from the device. When a problem happens, they cannot explain and say please just come. For example, we advised them over the phone, but they did not understand. Then we went, and just the power was off. We turned the power on and immediately the devices worked again.
> (Interview, 23rd May 2017)

This fear resulted in a passive attitude that affected the teaching practices with ICT. The passiveness could be found not only with teachers, but also for government officials. Therefore, according to ZTE staff, the number of maintenance reports from schools was continuously decreasing or even not existing.

7.4.2.3.2. Huawei

The Huawei education director noticed three signals which disturbed the ICT practices of teachers in the classroom: 1) a limited benefit from ICT materials; 2) the selection of trainees; and 3) reckless Plasma utilisation.

From the director's perspective, having a small number of ICT materials does not allow for students' benefits. For this reason, Huawei introduced thin clients which would be beneficial to more students due to its running mechanism (see the following quotation). The interview with the Huawei director was conducted after the interview with the KOICA-NIPA foreign advisor in CEICT. Hence, it was possible to ask the director for the rationale of the thin client installation, in favour over normal desktops. The interviewee explained:

> We create a different account for each student and for the traditional desktop when you log in, it will be the same with the previous one. All files are kept in there, as a shared computer. For our technology, the computer is centralised on the server and you are using your own account to log in. When you log in, the desktop is only for you. It is customised. Users can keep personal files in this personal disk, no matter which thin client you log in. The disk will come with you.

(Interview, 15th December 2017)

Using thin clients would be a reasonable approach, because more students could use the computers with a customised setup based on individual accounts. Thereby, one thin client could be used by a number of different students in different ways.
With regard to training, according to the interviewed director, Huawei's one-week course should be enough to understand the current system. He criticised the trainee selection as follows:

> Trainees do not have basic knowledge. For us, one week of training can make one guy, if he had a basic knowledge, he can understand this project and this technology (thin client) well. But if people know nothing about ICT, then even in one month you cannot teach them well. After that we recommended them to bring only those who have a basic knowledge. (Interview, 15th December 2017)

Interestingly, one interviewed ICT technician suspected that Huawei controlled the server and deleted their saved data. According to the director, this happened because he or she could not understand the mechanism properly. In other words, he assured that the ICT technician did not understand how the system operated during the training. He said:

> For what purpose do we delete their data? That is nonsense. There is even no way for us to check their data. Only they can access it with a personal password. Not even AAEB. For this project training, there is a limited number of trainees and time available. We train some of them, and they can train others. (Interview, 15th December 2017)

In a similar way, he was in doubt whether the current Plasma implementation could be seen as ICT practices in teaching even if teachers used Plasma. He thought:

> You need to use the Plasma properly, only the Plasma is not enough, you need to have good teaching to guide them. Plasma is not interactive, you just play it once, and what percentage of students can remember? They don't have a way to review it. Plasma makes the student receive the knowledge only passively. (Interview, 15th December 2017)

That was why Huawei emphasised its system of thin client that would allow students and teachers to utilise Plasma more interactive way.

7.5. Diagnosis

Section 7.4 explored the cause of the broken network by presenting potential signals and interpreting those signals as sources of network failure. Although some signals shared a similar aspect, the stakeholders inevitably magnified different fragmentary aspects of the broken network. This was firstly because each stakeholder had their own prioritised policies, and secondly because there was a lack of communication between stakeholders during programme implementation. Hence, individual actors could not properly understand the whole picture of what actually impacted on the network of ICT and practices.

On the basis of these insights, this section will diagnose the currently loosened ICT and education network caused by the aforementioned signals. As stakeholders interpreted the signals in their own ways, this section attempts to categorise signals based on similarity and interpret these signals in a broader context, which reflects how and why the network is broken. This was possible because this research did not only collect the voices of stakeholders, but also integrated individual interpretations into a synthetic analysis.

7.5.1. Teacher professional development

Stakeholders primarily indicated both the practicality and the curriculum of the PGDT as warning signs that indicated potential network failure. They argued that the PGDT InsT module did not reflect what was required of teachers in relation to ICT implementation in the classroom. However, in the Ethiopian context, the authority for designing the PGDT InsT curriculum is not entirely in the hands of an educational institution. As mentioned in chapter 5, 10 selected universities, which provided the regular PGDT course, used the same InsT module syllabus as a main textbook drafted by the MOE in 2013. In addition, InsT module of summer PGDT also used the same syllabus regardless of institutional difference. In other words, the MOE had to revise the InsT module syllabus in order to change the current curriculum. For instance, an AAU InsT instructor pointed out to MOE that they had to extend the credit hours, which did not allow for the conduction of practical exercises within the InsT module. However, the MOE rejected his suggestion without giving reasonable feedback. As a result, the InsT module instructor spent assigned credit hours on teaching theories rather than the actual practices. More seriously, teacher trainees could not even touch their compulsory teaching material, Plasma, while they were in training. This meant that teacher trainees encountered Plasma for the first time when they were placed in the secondary schools. As a result, they were initially puzzled when and how to implement the Plasma in teaching.

Under this circumstance, stakeholders organised short-term training in order to build the capacities of teachers to at least manage either Plasma or basic computer software. However, there were incidents of abuse of these short trainings organised by stakeholders. Firstly, as these short-term training sessions were not open to all trainees – the UNDP chose one teacher per school, they resulted in widening the knowledge gap between those who could attend them and those who could not. This gap harmed the overall network of ICT and practices because the latter trainees could not fulfil the role of a node that connected between human and non-human teaching elements. Secondly, selected trainees were sometimes treated distantly by their colleagues. Teacher D from Yekatit 12 described this experience in the following way:

> After I went to training and back to school, there was a conflict based on me like how did he get that? UNDP takes one teacher for the SchoolNet purpose…But I do not know how I was selected. There were other teachers (and) they need to take that training. So they ask why him (teacher D)? (Interview, 4th May 2017)

This isolated feeling was one of the main reasons why he moved to Addis Ababa. In other words, there might be some officials, lecturers, and teachers who changed their jobs to the private sector not entirely because of higher salaries, but also because of feeling marginalised after the training. Consequently, they were excluded from the network of ICT and practices because they were no longer in the educational field. This created another hole within the network.

Due to limited training opportunities, some teachers registered at private training centres even though they had to pay tuition fees at their own expense. When I asked private centre directors for their students' reasons of registration, they pointed out material availability and a practical curriculum. However, teachers knew that they would not have a chance to receive this type of training unless they paid and explored the opportunity on their own.

Following Latour's analogy, the role of teacher training should be to strengthen drivers (teachers) in their ability to reach the seat belt and buckle down before driving. However, under the current teacher training, drivers are not taught how to buckle the seat belt and why it is important to wear it. However, they are forced to sit in front of the steering wheel and drive without any instruction. More seriously, the police (MOE) simply overlooks with folded arms whether drivers break the law (network of ICT and education). Moreover, the police do not instruct drivers on the way of driving safe without violating the law.

7.5.2. Teachers' beliefs and attitudes

Stakeholders interpreted the teachers' anxious attitude towards ICT itself as a signal for the broken network. As presented in chapter 6, however, the teachers' general and pedagogical beliefs toward ICT were positive. For instance, teachers did not get frustrated when they used either mobile phones or computers for their own sake. This was to the surprise of the AAEB ICT technician, as those materials were usually more complicated than Plasma or ICT materials in the schools. Similarly, UNESCO officers noted that teachers could easily use Facebook via computer. This could suggest the conclusion that teachers' beliefs are only loosely coupled to the actual pedagogical practices. However, anxious beliefs, do mean teachers cannot properly include ICT in their teaching practices. Although the given ICT materials were often not functioning well, the teachers' anxiety worsened the connectivity of the ICT and practice network. Moreover, as highlighted by the CEICT director, some teachers refused to use ICT in their lessons because they believed that they were themselves better than technology. As shown in chapter 6 this attitude was rooted in their perceived incompetency towards ICT implementation, which materialised as antipathy, particularly when they had to use ICT for teaching. This related to the UNESCO officer's warning that continuously forcing teachers to use ICT would have a strong counter effect.

Furthermore, it is also important to investigate how the teachers' social status shapes their beliefs. No stakeholders shed light upon the teachers' reputation, which influenced their beliefs and attitude, as a network-loosening factor in the wider sense. The role of social status, which started with the low salary that was frequently mentioned by young teachers, meant they commonly considered having an additional part-time job. Due to the part-time job, they could not focus on the primary teaching job (see chapter 6). To make matters worse, the government compelled teachers to use ICT which could be bothersome and require extra time-investment for them. Thus, they had passive or sometimes negative attitudes towards ICT, because they saw their wellbeing and livelihood negatively affected by government policy.

Some teachers ironically became active participants when some organisations provided short-term training with financial compensation. For instance, in June 2018, when I was in Ethiopia for organising a workshop with the AAU, two of Bole teachers kept expressing their interest in participating in the workshop. I recommended both to my research team and they were selected as participants. Once I had the confirmation, I informed them both about the venue and time. However, they indirectly asked me whether they would receive any financial compensation for their participation. This showed that the motivation for training participation considered other factors than just the training content, and the possibility that the teachers were not passionate about the actual learning.

In Latour's logic, this attitude could be described as drivers who are distracted by other things. Although they recognised the importance of wearing the seat belt, they cannot focus on the seat belt because they know that they can drive without it. In addition, the seat belt is not comfortable when they drive, so they do not have much desire to buckle it unless there is a benefit. As a result, the network is not stable to maintain.

7.5.3. Materiality

When it comes to materials, there were three signals pointed out by stakeholders. Firstly, CEICT and Huawei affirmed that a shortage of ICT materials could cause network failure. They argued that teachers could not practise ICT because of a lack of available materials. In other words, there was no seat belt to buckle before driving. That was why Huawei suggested the thin client product as a solution to the material shortage. They believed that having thin clients would solve the problem of ICT material shortage because thin clients had a new desktop based on user accounts. To harness the advantage of thin clients, the Internet needed to be stable so that thin clients in Ethiopian secondary schools could maintain the network of ICT and practices.

However, the material availability did not guarantee an active ICT practice if the institution did not allow teachers to access it. For instance, in universities, there were ICT rooms equipped with computers, projectors, and screens. However, universities did not open those rooms to PGDT students because they were exclusively for Master's and Ph.D students (see chapter 5). This discrimination impacted on the practicality of teacher training in universities. Similarly, teachers could not use the computers in the school's computer lab, even if they needed to use for teaching purposes. This designated usage of ICT materials, or discrimination of access to equipment, sometimes limited the optimal use of available materials.

Secondly, USAID and Huawei pointed out that the teachers' inconsiderate utilisation of Plasma downgraded the potential of ICT. This behaviour affected the cohesion of the ICT and practice network, because the aim of ICT implementation in teaching is not to convert teachers in ICT experts, but to link them with ICT for pedagogical support. The current reckless usage of Plasma and ICT was described by a UNESCO-IICBA officer as follows:

> We believed that teachers' ICT skills should be linked with pedagogical skills of that particular subject. Teachers are not ICT people. We do not make them ICT people. We make them real teachers who combine content, pedagogy and technology. (Interview, 14th December 2016)

This issue was partly caused by a coercive government policy which did not provide guidance for teachers' ICT implementation, as shown in a number of observations such as a teacher with a folding arm and teachers without any interaction (see chapter 6), even though they used Plasma in teaching. In this case, the driver buckled the seat belt to the passenger's seat and continued driving, because the only part he/she focused on was on buckling the seat belt. This means that teachers are simply passively using ICT and satisfied with the usage itself rather than thinking of the objectives of ICT implementation (quality and equity of education).

Thirdly, KOICA-NIPA and ZTE diverted their attention to supporting materials for ICT utilisation. To be selected as a digitised school, collateral materials had to be ready to support either Plasma or computer labs including road access, empty rooms, and stable electricity. However, many digitised schools did not fulfil these fundamental criteria, particularly in the Tigray region[33]. KOICA-NIPA and ZTE interviewees had some doubts about the school selection process, which will also be discussed in subsection 7.5.5. These collateral materials determined the actual ICT equipment, because ICT could not function without these. Thin client was a representative example which became a good-for-nothing. This broken network of ICT and practice could be compared to driving in a car which had a basic problem such as doors which did not close. Since the doors have to be closed before wearing the seat belt, a small broken hinge turns the entire car (ICT and education) into a piece of metal. This is the current situation in the stakeholders' eyes because shortage or breakdown of basic infrastructure disturbs the whole system of ICT-integrated teaching.

[33]The political party based on Tigray region has dominated Ethiopian politics for almost 30 years because Tigray and its people have played a major role in terms of religious, military, and cultural history of Ethiopia (Addis Standard, 2019; AFP, 2020).

7.5.4. Opinion gap between DPs and the Ethiopian government, and Chinese companies' monopoly

A clear opinion gap existed between DPs and the Ethiopian government with regard to the ICT component expansion in GEQIP-E. Especially the procurement delay experienced by DPs contributed to the ineffectiveness of the ICT component in GEQIP II. In addition, WB and USAID did not regard the current Plasma-integrated teaching as an adequate ICT teaching practice. Based on those considerations, the budget for ICT and education was reduced because the DPs did not identify much progress, even after investing one billion US dollars. This opinion gap became an obstacle that shook the network, because DP support had been crucial for the Ethiopian government to push its plan. When the ICT component stopped expanding or maintaining the current level, every aspect of ICT practices would be in danger, including training, materials and even research.

In addition to the procurement issue, DPs could not see how Ethiopian government used ICT for ICT-integrated teaching. Naturally, this assessment was made based on their standard, which differed from the Ethiopian standard. Under this circumstance, the Ethiopian government did not agree with what DPs pointed out because they regarded their plan as an innovative ICT-integrated teaching strategy, based on elements such as Plasma. Even though Plasma had positive aspects, the Ethiopian government was sometimes too immersed in this type of technology. A major reason for this difference in perceptions might lie in the absence of discussions to correct the currently missing nodes within the network of ICT and practice. This was emphasised by the WB but there was no clear consensus, not only with the Ethiopian government, but also among the DPs.

Due to these circumstances, Chinese companies could take up a bigger role in the government's ICT and education policy. They play a crucial role, in which they now maintain or expand the Ethiopian ICT and education field. Consequently, these companies re-connect the potentially broken network. Apart from material support, ZTE and Huawei were heavily involved in capacity building for ICT-related sectors. This increased involvement of Chinese enterprises was not only found in Ethiopian context but also revealed in other contexts because business sectors involvement in education, particularly ICT-related, decentralised the whole climate of ICT educational policy design and implementation (Player-Koro et al., 2018).

For example, ZTE discussed the establishment of the training centre in Addis Ababa with the MOE and the MCIT even if it did not yet take place (see subsection 7.4.2.1.2). This represented ZTE's interest of providing more efficient and frequent teacher training for ICT implementation. In March 2019, ZTE opened a joint innovation centre with Ethio Telecom which supports ICT-related research and development in relation to the learning environment (Ethio Telecom, 2019; ZTE, 2019). The slight late-comer, Huawei, is even more actively involved in capacity building, which is illustrated by the establishment of the Huawei Academy and TVET college in June 2019 (Huawei, 2019). Moreover, ZTE and Huawei are not the only two companies that invest in ICT and education, Anhui and CCC also manage the establishment and procurement of an ICT data centre in the Ethiopian ICT and education sector. This domination of Chinese companies was not only possible due to their competitive price, but also because of their aggressive investment. This investment became a new challenge to DPs, because Chinese companies rather keep increasing more support regarding both infrastructure and capacity building compared to DPs that reduced their budgets for ICT components. As a result, the Ethiopian government could not deny Chinese companies considerable funding contribution to ICT and education because the government know ICT will become an enabler for Ethiopia to become a middle-income country (Morgan and Zheng, 2019). Even under the COVID-19, Huawei promises to enhance its contribution to ICT capacity building for young Ethiopians, at the primary, secondary, and higher education levels (Xinhua, 2020). Following Latour's analogy, members in Engineering team have different perspectives when the car gets into the pits to be repaired. Some engineers told the driver 'Do you want to drive? keep going. We are here to repair or even replace your car if required' whereas, the rest of engineers prefer to stop driver driving by saying 'please tell me why your driving is not stable'.

7.5.5 Political context

The political context was not highlighted by most DPs as a factor weakening the ICT and practice network. However, the KOICA-NIPA advisor identified the impact of the political context on the network while he worked inside the CEICT. He worked for the CEICT between 2016 to 2018, the period overlapping with the state of emergency (from 9th October 2016 to 4th August 2017). Hence, he could detect how the state of emergency influenced the ICT and education policy implementation. As mentioned in subsection 7.4.2.2.5, the state of emergency did not allow for continuing the baseline survey led by CEICT and DFID. This baseline survey could have made a huge difference to the whole plan, not only for the GEQIP but also for CEICT, because the survey results captured teachers' current levels of ICT knowledge and skills. These results could have informed what areas had to be focused on in order to improve. As KOICA-NIPA advisor said, although CEICT completed building ICT capacities and infrastructure in half of the country, the centre had no plan to continue the other half. In addition to the state of emergency, the regional government and the Ethiopian people opposed the federal government. These tensions even led to arson attacks on government cars, which had a distinctive black number plate.

Nevertheless, this research was continued and completed during the same time period. The main difference of this research compared to other initiatives was the close collaboration with the regional educational bureau. In addition to that, Ethiopian lecturers suggested for me to stay in Addis Ababa to prevent danger. Even though my research focus was limited to Addis Ababa, I would have liked to observe practices outside of the capital city. However, it was not possible to travel under the state of emergency.

The second aspect relating to the political context was the Ethiopian bureaucratic system which made teachers stand in fear of government officials. Although the state of emergency could sometimes spark the use of violence by federal officials; there was a general impression that any reports to government officials and their involvement caused bigger problems. Consequently, teachers hesitated to report if something was wrong in relation to the ICT implementation because they were afraid of being questioned. This hesitation extended to the Chinese company, ZTE. The ZTE officer emphasised:

> Most times we are waiting for a call from them. When they have problems, they want us to support and we give them a contact person in every school. In addition, we also contact the MOE. Apart from that, we give a routine maintenance half a year. We only can stay here in Addis Ababa. If they do not call us, we do not know. (Interview, 23rd May 2017)

This fear of teachers within the bureaucratic political system loosened the network of ICT and practices, with the consequence that materials went unrepaired, as I witnessed with teachers sometimes opening malfunctioning Plasma equipment in front of our research team (see chapter 6). Furthermore, even the school principal was nervous in presence of government officials.

Under this bureaucratic system, the digitised school selection process sometimes was suspected by the KOICA-NIPA advisor and the ZTE officer. As mentioned in subsection 7.5.3, some selected schools were not ready to be digitised and most of them were located in the Tigray region. Traditionally, Tigrinya people dominated high positions in most political, economic, and social sectors since the 1991 revolution (Gebregziabher, 2019; Mamdani, 2019). Two interviewees raised the suspicion that this political clique might influence the school selection process. In other words, well-equipped schools which had the potential to strengthen and stabilise ICT practices and networks, were not selected to be digitised, due to factions within the political party. In fact, many digitised schools still faced a number of basic infrastructure-related challenges, thereby not contributing to the outcome on ICT integration in teaching practice that the government expected to see. My research team also experienced an example of a politically supported school principal within our sample school in Addis Ababa: from the beginning, the principal did not cooperate with us on research administration. We gave him a sharp warning that his school could be excluded from the intervention workshop. When his attitude remained unchanged, we decided to exclude the school. One month later, my colleague told me that this school would not be excluded and he seemed to be unhappy to continue working with this school. On top of that, during the workshop, the principal was in the U.S for a two months training, for which he was selected by the government as the representative for all Ethiopian secondary school principals. This represented his strong linkage with the government.

7.6 Conclusion

This chapter sought to understand the current weak network of ICT and teaching practices by synthesising the warning signals provided by stakeholders. This chapter investigated how stakeholders interpreted potential signals that led to the broken network of ICT and practices. It borrowed the description of driver and seat belt from Latour and tried to discuss what influenced the fragmentation of the network. Even though Latour's example did not allow humans to break the network due to the strong engagement of non-human elements, there were a number of potential sources of network failure found by stakeholders in the relationship between human (teachers) and non-human elements.

Although each stakeholder specified either human or non-human elements as more influential factors within the network, it was not important to weigh which one had more impact on the broken network of ICT and practices. With a symmetrical viewpoint on both human and non-human aspects, it was more important to examine the possible entanglement of both in the Ethiopian context. This resulted in five different aspects of diagnosis which would not only introduce the perspectives of stakeholders but interpret the causal relationship among the aforementioned signals. For instance, there were fundamental reasons and background conditions why teacher training and teachers' beliefs counted as potential signals that disconnected the network. This diagnosis was based on a number of in-depth interviews with teachers and instructors who were primarily in the ‘driver’ position. Above all, it was only possible to have a closer look at the political context due to having a CEICT insider and ZTE officer among the interviewees. Without these interviews, the political unrest, as well as the political characteristics, and clique would not have been identified as important signals that paralysed the network of ICT and practices.

I have shown how in recent years, the leading role of DPs in ICT and education has transferred to the Chinese companies. The budget cut by DPs has since been filled by Chinese financial resources, which have come to dominate this field. When DPs experienced donors’ fatigue, after having spent US $1 billion on the ICT and education sector, ZTE and Huawei were still eager to invest more; not only in ICT itself (having invested more than US $3 billion in infrastructure) but also on ICT-related training (Gagliardone, 2018). Furthermore, Anhui and CCC are currently working with the MOE and CEICT. Traditional donors have criticised the Chinese type of aid or investment, which only promotes infrastructure construction. However, as stated above, these four primary Chinese companies now actively promote capacity building that could contribute to an enhanced sustainability of the Ethiopian ICT and education project.

Finally, the current government passed a bill for the liberalisation of the telecommunication sector, which has been controlled by the government until June 2019 (Kiruga, 2019). This will allow more foreign ICT companies to invest in the Ethiopian telecommunication sector in the future. As a consequence, the government will rely less on DP funding for the continuation of its own ICT and education plan. However, having more investment would not guarantee a sustainable expansion of ICT and education unless the government and stakeholders develop an Ethiopian-relevant ICT framework based on constructive discussions and consensus.

CHAPTER 8: Conclusion

8.1. Introduction

ICT diffusion is taking place all over the world and still in the process of growing, so that ICT integration into education is inevitable. This trend has clearly been found in Ethiopia where ambitious ICT policies and ICT material provision are objectives of the government. Nonetheless, in many countries the actual level of ICT practices inside of the classroom is low; this has also been an issue in Ethiopia (Teo, 2009; Mura and Diamantini, 2014; Ziphorah, 2014; Eickelmann and Vennemann, 2017).

To understand the reason for the low level of ICT practices, I have focused on teachers, who are considered a fundamental element of ICT utilisation in the classroom (Schlager and Fusco, 2003; Lawless and Pellegrino, 2007; Almerich, et al., 2016). I set out to investigate the trajectory of teachers' experience of ICT from teacher training through to secondary schools. An examination of teacher training is important because many studies have shown that teachers' lack of knowledge and training impedes ICT integration within teaching (Pelgrum, 2001; Kozma, 2005; Unwin, 2005; Mamun and Tapan, 2009; Khan et al., 2012). Hence, teacher training has been emphasised as a prerequisite stage which intends to make teachers familiar with ICT skills and knowledge (Kozma, 2005; Unwin, 2005; Khan et al., 2012). At the same time, it is also critical to explore how teachers practise and experience ICT in their school workplace, because there will be a mixture of enabler and disabler in teachers' ICT practices in schools.

From teacher training to secondary schools, I have also paid attention to Ethiopian teachers' beliefs and values in ICT. The values and beliefs shape individuals' perspectives and attitudes on ICT that determine the level of practices (Harrison and Rainer, 1992; Albirini, 2006). In particular, in developing countries, the examination of teachers' beliefs is important because ICT has not previously been a part of their educational culture (Sharma, 2003; Albirini, 2006). In other words, this cultural unfamiliarity might discourage Ethiopian teachers from implementing ICT in their educational context.

Apart from the focus on teachers, I also examined the contribution of ICT materials based on the perspectives of Sociomateriality and ANT. This is because teachers' beliefs and practices of ICT implementation are not simply influenced by their experience in training and teaching but also from ICT materials themselves. On the basis of these theoretical frameworks, I diagnose the broken links in the network between teachers, ICT materials and classroom practice. The network is crucial in determining teachers' ICT practices in the classroom.

Lastly, I have explored the reflections of stakeholders, regarding the current situation of ICT and education. This is because stakeholders have involved in this field and experienced the progress of ICT development in Ethiopia. Thus, they could be more objective when diagnosing the current stage of ICT implementation.

The main research question for this research was:

How are Ethiopian secondary school teachers' beliefs and practices about the use of ICT constructed?

The sub-questions were:

1. What factors prevent or enable teachers' ICT competencies in teacher professional development?

2. To what extent does materiality influence teachers' beliefs and practices?

3. How do different stakeholders interpret the cause of ICT implementation failure in education?

To answer these questions, I conducted the fieldwork in Addis Ababa from November 2016 to August 2017. I visited teacher training institutes, secondary schools, and met with stakeholders to identify the actual ICT implementation in education. I also conducted two more short fieldwork trips (December 2017 and June 2018) because I found other influential stakeholders that played important roles in ICT and education, such as private training centres and Chinese companies, that I needed to visit.

This conclusion will first, in section 8.2, represent the policy relevant findings that could improve the teachers' ICT practices. Section 8.3 briefly introduces the research methodology and section 8.4 revisits the key findings that this thesis has investigated. Section 8.5 discusses the contribution that this research has made to knowledge. It categorises into two: 1) theoretical; 2) methodological and empirical contributions which show the originality of the thesis. Section 8.6 will consider the limitations of this thesis that could be addressed. Section 8.7 will conclude with suggestion of some possible future research.

8.2. Policy relevant findings

The following discusses ways to enhance the effectiveness of policy implementation and teachers' ICT practices in the classroom. The Ethiopian teachers' general and pedagogical beliefs were positive but this research identified that these positive reflections did not turn into teachers' pedagogical practices using ICT. Teachers' belief is associated with psychological disturbance that discouraged teachers to practise ICT for its intended pedagogical purpose. This is because InsT module standardises the format of ICT-integrated teaching regardless of contextual characteristics. This standardisation goes against TPACK that understands each teacher could have a unique combination of three knowledge areas depending on contexts and experience. Teachers were demotivated by the absence of ICT materials in the schools, and were not able to think of an appropriate way to implement ICT in their own contexts. Therefore, teacher training needs to educate teachers (trainees) to contextualise ICT implementation depending on availability. This can better equip teachers to be ready and flexible when faced with unexpected circumstances and ICT environments in any school.

The objective of assigning practicum in teacher training curriculum is to provide trainees a chance to meet students and experience the actual classroom before official teacher appointment. As Plasma is a compulsory, practicum is supposed to be the first time for trainees to use Plasma and other ICT-related teaching if the circumstance permits. However, this study found that the current schedule of practicum clashed with a national holiday. Due to the absence of students, this only allowed trainees to teach either one or maximum two classes. That is why practicum has always been criticised as unsatisfactory, even if it is continually revised, including in TESO and PGDT.

This schedule clash might be considered as a small thing but exerts the biggest harmful influence to trainees' practicum programme. The failure of teacher training to provide adequate practical experiences for trainees means trainees and teachers are afraid of damaging ICT materials. Consequently, teachers simply gave up trying ICT implementation, for example in some cases they thought the black screen as a big problem but failed to understand that sometimes the computer is simply not connected to the socket. The MOE could reschedule practicum so it provides more chance for teachers to contextualise ICT for teaching practices. In addition, the MOE could scale up the access to ICT materials and practical experience if it and secondary schools support continuous professional development. There are two possible ways: 1) open the current computer labs to teachers; 2) collaborate with the private ICT training centres. Some schools already open their computer labs to teachers who need to use ICT for teaching preparation and this encouraged teachers to practise ICT in their teaching. Above all, it would be considered as a positive encouragement to the teachers that their schools are supportive of their work.

The collaboration with private training centres could be for teacher trainees' practices and exercise. The MOE could identify private centres, which are willing to join the government ICT training curriculum, and ask them to open their centres for teacher trainees when the centres are free. As the centres are located all over the city (Addis Ababa, but it will be the same in other cities that provide regular PGDT programme), trainees would be able to access the venue and practise what they have learned in the PGDT.

Teachers frequently experienced the malfunction of ICT materials including Plasma TV, computers, and electricity. This frequent breakdown made teachers have negative perceptions of ICT implementation because ICT materials were not always ready to use. For instance, mechanical troubles with Plasma TV and the generator in the Bole schools caused delays in proceeding with the curriculum because Plasma is a compulsory teaching method (see chapter 6). In a similar vein, ill-prepared ICT materials within GEQIP II stopped not only the ICT implementation in education, but also the entire ICT and education component in GEQIP-E (see chapter 7). The harm of ill-preparation was felt entirely by teachers and students who needed to use ICT materials for teaching and learning. Although teachers faced these malfunctions and ill-preparation of ICT materials, they were the first to be blamed (Ghavifekr and Rosdy, 2015; Olsen, 2015; Olofsson et al., 2017). Faced with frequent malfunctions, teachers are not able to focus on teaching because they are distracted by managing ICT. This eventually lead to a reduction in the quality of their training. Therefore, the government needs to provide administrative support related to ICT material provision and maintenance which frees up teachers to concentrate on teaching. Having this stable administrative support from the government could maximise the potential of ICT and enhance the quality of education.

The medium of instruction, English has been frequently mentioned as a barrier that deteriorates learning outcomes (see chapter 5 and 6). Although English does not directly link to the ICT practices (particularly Plasma TV), both teachers and students could not fully comprehend the content of Plasma because the language of instruction was English and their grasp of English was limited. This rather turned into antipathy against ICT materials and constructed negative beliefs in ICT practices. The original intention of Plasma TV was to guarantee equity and quality education via ICT. However, if English proficiency was an obstacle to content understanding, Plasma TV instruction in fact prevented this objective from being realised. MOE does not necessarily need to change the whole existing system (a medium of instruction) but consider the way of improving the content understanding. That could be inserting subtitles in the existing content, which would support teachers' instruction and students' learning process. Then, teachers will have neither fear nor antipathy of using Plasma TV; further, students will also be more confident to share their thoughts with better understanding (see chapter 5: having active discussion in AAU InsT module). In addition, in the bigger picture, this might decrease the drop-out rate because students could achieve better learning outcomes.

8.3. Methodology

The fieldwork was conducted in Addis Ababa between November 2016 and August 2017. I was affiliated to the Institute of Educational Research at Addis Ababa University as a graduate researcher. The research was conducted on a similar trajectory to teachers' development: starting with teacher training and ending in the classroom. I visited two teacher training institutes and two private training centres to conduct classroom observation and interviews with instructors and trainees. This helped me understand the pedagogy and material settings of teacher training which influence to teachers' beliefs and practices about ICT use. Subsequently, six secondary schools were visited to listen to teachers' voices and get a representation of the reality of ICT-integrated teaching practices. Within schools, I also interviewed vice-principals, ICT technicians, and students who spoke first-hand of their experience as to how teachers implement ICT in teaching practices. When it comes to stakeholders, both national and international organisations were interviewed to represent the broader level of current ICT education from more outsider perspectives. In addition to the first nine months consecutive fieldwork, I visited Ethiopia two more times (December 2017 and June 2018) in order to investigate influential actors, which were difficult to schedule for interview, such as Huawei, MCIT, and private training centres.

8.4. Key findings

The investigation into the network between teachers and ICT materials allowed me to answer the research questions. This diagnoses the current potential network failure in Ethiopia that leads to low level of teachers' ICT practices in the classroom. At the same time, it proves that the foci of this thesis: 1) teacher training and materials; 2) secondary schools and materials; 3) stakeholders, were accurate to understand teachers' beliefs and practices about the use of ICT. With the perspective of Sociomateriality and ANT, above all, it introduced the role of ICT materiality that contributed to teachers' beliefs and ICT practices. However, what the ANT perspective did not capture was the intimacy of what ICT materials means to teachers that actually determined teachers' pedagogical practice. This was why this thesis also explored the concept of teachers' beliefs and TPACK to fulfil the gaps of Sociomateriality and ANT. This theoretical synthesis helped to discover the following findings that answer the questions and contribute to the existing knowledge.

Chapter 5 discussed how teacher trainees received training in relation to ICT implementation in teaching. This chapter answered research questions one and two by exploring the Ethiopian teacher training under two themes: 1) pedagogy and 2) materiality. It investigated three venues to collect the data, which were AAU, KMU, and the private training centres.

Teacher pedagogy could be understood as an assemblage of heterogeneous actors' interactive activities in learning environment from Sociomaterial and ANT perspective.

At the same time, the role of materiality inside of teacher training institutes and private centres was examined to understand how materiality affected instructors' teaching practices as well as trainees' beliefs and practices about ICT.

Through classroom observation and interviews with instructors and trainees, I found that the current pedagogy of AAU and KMU instructors did not encourage trainees to implement ICT. First of all, the instructors possessed different levels of knowledge. Both instructors from AAU and KMU had a good knowledge of content and technology but their pedagogical knowledge was not efficiently integrated with the other two knowledge areas. Having effective association among the three knowledge areas was what TPACK stressed and without this, trainees would not experience proper ICT-integrated pedagogy during the training. In addition, the medium of instruction, English, sometimes disturbed vibrant discussion (explanation and communication) within the classroom which could be a part of pedagogy. Secondly, the assessment, which is also a part of pedagogy, did not motivate trainees to utilise ICT. If instructors set a clear criteria of assessment, which required trainees to use ICT, they would practise ICT at least in order to submit the assignment. Thirdly, the work ethic of instructors was not satisfactory to trainees because trainees felt that instructors were not committed to their teaching. Instructors' negligence in carrying out their duties led to poor pedagogical engagement with trainees and this minimised the learning outcome of training.

When it comes to materiality, the present status of ICT materials in teacher training institutes discourages trainees from integrating ICT into their teaching. As Ethiopia is in the process of ICT development and expansion, material shortages would be expected, but more seriously PGDT trainees were not allowed to use existing and unused materials due to their lower degree level than Maters and Ph.D. In a similar vein, Ethiopian cultural characteristics of gerontocracy within university department allowed senior professor to monopolise department-owned ICT material. Moreover, what both instructors and trainees felt from ICT materials was anxiety because they did not have ICT experience and maintenance ability. Ironically, at the same time, the ownership of ICT materials (particularly Apple products) possessed a meaning of high social class and wealth in Ethiopian society. For this reason, some instructors and professors simply owned a Macbook or iPad and carried it even if they could not use it. In other words, extra cost was required to either own the materials or enrol in the private centres to practise what trainees learned in the university environment.

Following this, chapter 6, concentrated on teachers' beliefs, perceptions and perceived value of ICT, particularly for educational purposes (Ertmer et al., 2012). The examination of teachers' beliefs was important because belief is a hidden major factor that shapes teachers' pedagogical approaches in the classroom (Harrison and Rainer, 1992; Albirini, 2006). I visited six digitised schools in Addis Ababa and conducted interviews with 30 teachers. I asked each individual teacher's general and pedagogical beliefs regarding ICT. The general beliefs towards ICT of every interviewee were positive whereas the pedagogical ones were diverse, as follows. Firstly, teachers believed that ICT could make their teaching *simple* which could be good if teachers took this advantage in a desirable way; however, many teachers rather became irresponsible and placed the responsibility for teaching on the Plasma teacher. For some teachers, the simplicity of relying upon the Plasma teacher to teach was desirable as they could save their energies, meaning they were able to maintain two jobs (often a second job was required to compensate for the teachers' low salary). This echoed the work ethics of instructors, who prioritised personal activities over teaching profession, which led to unfavourable learning outcomes. Secondly, ICT was labelled as *being intellectual* and *upper class* by teachers because it simply required extra and big expenses. In this regard, only a few teachers owned personal ICT equipment and their usage could not be extended to pedagogical use but remained for personal and leisure purposes. This also linked to the societal values of ICT materials found in professors in AAU (see chapter 5). Thirdly, from teachers' perspectives, ICT possessed the meaning of *obligatory materials* which restricted their autonomous pedagogical design. This led to antagonistic feelings towards ICT materials, particularly PTI. Fourthly, some teachers had *a sense of inferiority* towards Plasma TV teachers, who was supposed to be supplementary to classroom teachers. This inferiority turned into pedagogically negative beliefs towards ICT materials and Plasma TV which in turn hindered teachers from practising ICT in the classroom.

Chapter 6 also investigated the influence of materiality that overruled teachers' beliefs and practices in terms of ICT. The first fundamental and frequent material obstacle was a lack of electricity that discouraged teachers from ICT implementation. Second is an antipathy toward Plasma TV use due to frequent system failure and the content of Plasma TV. This is a similar point as to having a sense of inferiority but this linked specifically to frequency of Plasma TV breakdown. In addition, the pace of Plasma content explanation was too fast to use as supplementary teaching methods. A third obstacle is computer shortage and malfunction that discouraged teachers from ICT practices. Fourth, was identified as being prejudice against Chinese products that were situated in almost every school in Ethiopia. Even for the average Ethiopian citizen, any Chinese product had a connotation of being ‘fake’ and ‘fragile’ this reputation meant that teachers simply did not like to use any Chinese made ICT materials, even if they were functioning well.

Chapter 7, focused on stakeholders heavily engaged in the network of Ethiopian ICT and education. This chapter borrowed Latour’s seat belt example to diagnose the current situation of Ethiopian teachers’ ICT practices in the classroom. The situation in Ethiopia was a driver (teacher) who do not have enough strength (ICT competency) to pull down the seat belt (ICT). Under this circumstance, the driver (teacher) is driving the car (ICT and education) without wearing the seat belt. However, in the pits, each member of the engineering team (stakeholders) realises that in order to improve the situation they need to not only cultivate the strength to buckle the seat belt but also the knowledge and capacity to drive the car properly.

The difference between Latour’s example and the Ethiopian case is that Ethiopia had countless potential factors (signals) that could result in the network failure. These signals were interpreted by stakeholders (the engineering team) because the driver (the teacher) sometimes could not objectify the signals. This interpretation was crucial because it can help to fix network failure in the future. Stakeholders encompassed national, international organisations, aid agencies, and Chinese companies which are actively involved in ICT and education policy implementation.

Both signals and interpretation were diverse but they could be summed up in three points, which matched up to the foci of chapter 5 and 6 (teacher training, teachers’ beliefs, and materiality). This proves that my research matched with what stakeholders emphasised as needing to be addressed to encourage teachers’ ICT practices.

Firstly, stakeholders pointed out that the focus of teacher professional development needed to be revised. The current teacher training leads to the situation that drivers (teachers) are not taught how to buckle the seat belt (ICT) and why it is important to wear it. However, they (teachers) are forced to sit in front of the steering wheel to drive a car. More seriously, the police (the MOE) simply overlook, with folded arms, as to whether drivers simply drive a car, rather than enlightening them on the basic safety education: wearing a seat belt. Under these circumstances, the Ethiopian teacher training repeatedly face similar challenges because MOE does not yet focus on teachers' ICT beliefs and awareness throughout TESO and PGDT.

Secondly, as an extension of teacher training, stakeholders indicated teachers themselves had to rearrange their beliefs and attitudes toward ICT. From the stakeholders' perspective, Ethiopian teachers' attitudes could be seen as follows: drivers (teachers) cannot prioritise the seat belt (ICT) because they know that they still can drive without the seat belt. Further, they are not comfortable with the seat belt when they drive and they do not have much desire to buckle it unless they experience a visible benefit of wearing the seat belt. Although police (MOE) said that the seat belt is compulsory, their beliefs in the seat belt did not guarantee the safety of drivers on the road. In other words, teachers believed that having ICT would not guarantee the better ICT-integrated teaching.

Lastly, stakeholders agreed with the influence of ICT materials on teachers' ICT practices. The police (MOE)'s coercive approach of wearing the seat belt (ICT) sometime leads to misapplication of the seat belt. What drivers (teachers) now focus on is wearing a seat belt and starting to drive. This haste makes the driver buckle the seat belt to the passenger's seat. Although drivers might feel safe, wrong buckling does not protect the drivers in the car accident. This means that teachers are simply using ICT and satisfied with the usage itself, rather than thinking of the objectives of ICT implementation (quality and equity of education). In addition to the seat belt, a small hinge (electricity or basic ICT-related infrastructure) on the car door is broken so that the entire car (ICT and education) becomes a useless piece of metal. This is the current situation in the stakeholders' eyes because shortage or breakdown of basic infrastructure disturbs the whole system of ICT-integrated teaching.

Apart from these three common points, there was a clear opinion gap among stakeholders, particularly between Ethiopian government and DPs. That was why DPs reduced the large amount of budget for ICT component in GEQIP-E even if Ethiopian government kept expanding this component. However, Chinese companies supported the plan of the Ethiopian government and kept investing in Ethiopian ICT and education. Thus, the close relationship between Ethiopia and China will continue in the field of ICT and education. In Latour's logic, this could be understood as members in the engineering team have different perspectives when the car gets into the pits on how it ought to be repaired. One engineer said 'keep going we can support you under any circumstances' whilst the other engineer said 'This is not right. Please stop this race and think what to improve'

In addition to these, one more important signal was found during the interview with

KOICA-NIPA advisor and ZTE officers. This would not be revealed unless this thesis conducted the interview with stakeholders that rarely participate in the research. This point was associated with the political context of Ethiopia, not only the state of emergency, but also the Ethiopian bureaucratic system. Two interviewees felt that the political system favoured government friendly headteachers and, as such, invested material goods inequitably, specifically to those schools which were politically positive. This could obstruct the development of ICT implementation across the country.

8.5. The tension between government objectives and the classroom reality

The standardised curriculum with ICT integration, which aims at enhancing the quality of education, has rather led to a great tension between the government and teachers. This is firstly because the government's plan of ICT implementation has not contextualised both policies and ICT materials such as thin clients (see 6.5.2.3 and 7.5.3). Secondly, the government takes a coercive approach in relation to ICT-integrated teaching without enough consideration of the reality. Regardless of the current Ethiopian ICT standard, the rapid progress has being made by the government and more seriously the benefit normally goes to pro-government schools or principals that follows the policies. This is why KOICA-NIPA and ZTE officer had doubts about school selection process. discrimination does not allow other ambitious and innovative schools to be selected and enlarge the ICT readiness gap between schools. Under this circumstance, end-user, teachers have struggled with the malfunction of ICT and mismatch curriculum prescribed by the government. As a result, this incurs teachers' distrust of government policies and materials themselves.

8.6. The contribution of the thesis

8.6.1. Theoretical contribution

This thesis offers the synthesis of theories and concepts which has not applied to the field of ICT and education. Both Sociomateriality and ANT form the theoretical basis of my research and investigate the role of ICT materials in teachers' ICT practices. Moreover, I have integrated the concept of teachers' beliefs and TPACK into this theoretical basis because ICT practices are determined by teachers' personal value (related to beliefs) of and experience (related to TPACK) with ICT from teacher training to the workplace.

There have been some research that employed either Sociomateriality or ANT in ICT-related educational research (Waltz, 2006; Heeks and Standforth, 2007; Fenwick and

Edwards, 2010; Johri, 2011). What make their research distinctive is that they stress the importance of materials, which has been neglected. In general, the presence of material is simply taken-for-granted and situated to be used by human. However, teachers' ICT practices have not been easy to fully explain without considering the contribution of materials. That was why Sørensen (2009:2) argued:

> Materials may be used by human, but they may also use the humans and influence and change the educational practice which then is no longer particularly human.

Taking this symmetrical perspective helps to investigate the interrelations between human (teachers) and nonhuman (mundane materials in/outside of the classroom) that either form or dissolve the network of ICT practices.

On the other hand, what this perspective could miss is the major difference between human and nonhuman, which is the emotional intimacy (i.e. beliefs) inherent in human activity. In other words, what the nonhuman, material artefacts mean to human actors, and how that impacts on how people engage with ICT. It is therefore important to consider how teachers believe and perceive ICT in order to maximise the potential of ICT before attaching them to ICT in the classroom.

The emphasis on teachers' beliefs has been studied by other researchers (Ajzen and Madden, 1986; Pajares, 1992; Kozma, 2005; Unwin, 2005; Khan et al., 2012) but they are not incorporated into the perspectives of ANT and Sociomateriality. My interpretation of teachers' beliefs is constructed by the combination of pedagogy and materials (as presented in chapter 4 figure 4.1) and pedagogic practice is also viewed as a by-product of a heterogeneous assemblage under ANT perspective (Fenwick and Landri, 2012). This is where and how I found a point of contact between ANT and teachers' beliefs (pedagogy and materials). For instance, instructors' pedagogical approach in teacher training institutes influences trainees' beliefs and practices about the use of ICT. In addition, materials situated in the institutes would either connect or disconnect with instructor and trainees so that determine their ICT practices.

Moreover, TPACK is also discussed to integrate into the Sociomaterial and ANT approaches. It introduces technological knowledge in the framework of pedagogical content knowledge developed by Shulman (1986) in order to effectively implement technology into teaching practices (Koehler and Mishra, 2009). This interweaving knowledge is emphasised as 'a unique combination' because each individual teacher teaches different content in different pedagogical ways with different technology depending on availability (ibid:66). In addition, it considers contextual factors that result in even more unexpected assemblage of three types of knowledge (Harris and Hofer, 2011). In my thesis, the interpretation of TPACK composition is similar to teachers' beliefs; the combination of pedagogy and materials (bundle technology and content up) (see chapter 3 figure 3.1). This understanding integrated into Sociomateriality and ANT which required more innovative pedagogical practices of technology, especially Ethiopian teachers who experience a frequent shortage of ICT materials and different teacher training.

8.6.2. Methodological and empirical contribution

This thesis is the first research that examines Ethiopian teachers' beliefs and practices regarding ICT use in the classroom. Although there are a couple of studies which discuss the challenges of implementing ICT teaching practices (Abera, 2013; Ahmad, 2013), they primarily focus on material shortage rather than listening to teachers' own rationale of not utilising ICT in the classroom.

With the synthesis of theories and concepts, this thesis helps to figure out a way to investigate teachers' beliefs and practices about ICT use. However, the circumstance in Ethiopia was challenging not only because of ICT material shortage but also because of the state of emergency. As discussed in chapter 2 and 3, the ICT-related environment in Ethiopia was not similar to countries with actively and freely integrated ICT into education. For instance, there were frequent power cuts and not enough ICT materials in the classroom. Moreover, despite ICT promotion in government's policies, the government still monitored and even suppressed using the Internet.

Under these circumstances, I had to consider a research methodology that could illuminate the theories and concepts in reality. Above all, it was critical to decide the way of assemblage theories and concepts and sequence those applying to the Ethiopian context. As teachers are a fundamental element of ICT practices, I started to trace their initial career path, teacher training (Schlager and Fusco, 2003; Lawless and Pellegrino, 2007; Almerich, et al., 2016). In teacher training institutes, I investigated the instructors' pedagogy and material settings, in the institutes that construct the trainees' beliefs and practices about ICT use. At the same time, I examined instructors' pedagogy with the perspective of TPACK by specifying the balance of three different knowledges. This found that instructors lacked pedagogical practices of technology. With regard to materials, instructors and trainees were demotivated by material shortage. The more demotivated the more they were anxious about ICT materials. Moreover, contextual characteristics such as gerontocracy and discrimination against degree level prevented trainees from utilising ICT materials. These findings created the foundational value of teachers' ICT practices constructed in the institutes.

After conducting research in the teacher training institute, I moved to the case of secondary schools in order to identify teachers' beliefs and practices of the ICT use in the workplace. The schools are the main space where teachers practised ICT and were exposed to the ICT environment. Teachers were directly asked their general and pedagogical beliefs regarding ICT to identify the correlation between beliefs and ICT practices. As the schools provided a different ICT environment, teachers could have different beliefs and practices about the ICT use compared to teacher training institutes. In comparison to Ertmer's (1999; 2005) studies (the relation between beliefs and ICT practices), I added the influence of availability and functionality of ICT materials' upon teachers' beliefs that linked to teachers' ICT practices. Moreover, this also linked to possible future research offered by Abera (2013): raising teachers' ICT awareness in order to encourage ICT practices in the classroom. This was why the societal value of ICT materials within the Ethiopian society was investigated. This concluded that ICT is associated as having the value of being regarded as intellectual and upper class (see chapter 5 and chapter 6). Given the expense of ICT, personal ownership of ICT equipment became a status symbol and the ownership itself was more important than actual practices. Thus, the usage of ICT remained for personal practice rather than pedagogical practices. In addition, there was a clear antipathy against ICT (particularly Plasma TV instruction).

Lastly, this thesis diagnosed possible network failure between teachers and ICT practices via stakeholders' perspectives. The stakeholders' reflections were examined to avoid biased teachers' beliefs and practices described by themselves. My colleague in IER agreed that this would be helpful to understand the current stage of ICT and education. Interestingly, stakeholders pointed out the same three aspects: 1) teacher training; 2) teachers' beliefs and attitudes; 3) the materiality. I also included the voice from Chinese companies which normally became the target of criticism and do not normally participate in research interviews. In addition, I interviewed the KOICA-NIPA advisor who was able to share his experience as an insider of CEICT which could represent the rationale of current ICT educational policies.

These contributions will play a guiding role for conducting similar research, particularly in the context of developing countries. This is because in most developing countries, which experience a shortage of ICT materials, there is a desire to integrate ICT into their classroom, for the extension of national economic development. This thesis demonstrates how to assemblage theories and concepts in order to make methodologically effective research; this could be applied in similar developing contexts which experience similar difficulties.

8.7. Limitations of the thesis

Under the political unrest, conducting the research was challenging even if the state of emergency was lifted almost by the end of my fieldwork. Nonetheless, I strategically conducted the research to collect the data and interact with Ethiopian teachers for a meaningful achievement so far as time and money would permit. After the completion of research, when I reflected on my doctoral research, I could find several limitations. These are as follows:

First of all, this thesis has the limitation of being conducted in a single city, Addis Ababa which has the best ICT infrastructure compared to the other regions. In this regard, the other regions could possibly face different challenges that Addis Ababa has not, and vice versa. In the same vein, the information from teachers and teacher trainees are mostly representing the case of Addis Ababa so that their beliefs and practices also cannot be understood as the overall Ethiopian teachers.

Secondly, both the interview and observation were conducted as one-off events in teacher training institutes and secondary schools. In this regard, the training given to the trainees could not be directly associated with the teachers' ICT practices in secondary schools. The result might have been favourable if this research traced trainees from teacher training to secondary schools and followed up their perceptional and practical changes about ICT use.

Thirdly, this thesis could have focused more on secondary school students' feedback in terms of teachers' ICT practices. Although I had a focus group discussion with students in each school, I did not run the discussion session because it did not belong to my research topic. However, I realised students' experience inside of the classroom would directly represent teachers' ICT practices. Hence, I requested to use a part of the focus group discussion for my thesis.

When it comes to the selection of stakeholders, fourthly, I only conducted the interview with the major donors (e.g. World Bank, U.S., and U.K.) and major Chinese companies (ZTE and Huawei). This meant I missed the other 12 DPs' reflections on Ethiopian ICT and education (see chapter 2). Moreover, this thesis could also miss the other Chinese companies (see chapter 7) that recently actively engage in the project of ICT and education.

Lastly, although this research was intended to produce in-depth reflections on teachers' beliefs and practices as a qualitative study, the data is unable to be generalised due to a small size sample. If I collected quantitative set of data and represented overall descriptive statistics, the readers might have been able to understand the whole picture of Ethiopian ICT and education.

8.8. Suggestions for future research

Here I suggest possible future research that can lead to further information which might improve Ethiopian ICT-integrated teaching and learning processes.

First of all, as mentioned in the limitations above, this research was conducted in a single city, Addis Ababa. This research was conducted in 2016-2018, where I found it difficult to observe ICT-integrated teaching in both teacher training institutes and secondary schools; however, since then, the ICT environment in Ethiopia is likely to have been improved. With this in mind, it would be worthwhile to extend the scope of such research to the entire country, which will be helpful in identifying overall teachers' beliefs and practices about ICT use.

Secondly, both the Ethiopian government and USAID would like to extend the benefit of ICT-integrated teaching into primary education (see chapter 7). As this research emphasised the importance of identifying teachers' beliefs, it will be useful to know how primary school teachers value ICT as a pedagogical tool for primary school students. This could be a baseline research that helps to design ICT implementation policy in primary level.

Thirdly, interviews especially with teacher trainees and teachers were one-off events so that there was no continuity in terms of tracking the development of individual teacher trainees. This is because, for this thesis, it was the best option that could understand both teacher training and the actual implementation in the classroom. To fully understand the growth of trainees and effectiveness of training, conducting a longitudinal study will be helpful to collect a richer and more accurate data and picture of reality throughout the year of training and teaching profession.

Fourthly, the focus of this thesis was on how teachers perceive and practise ICT in the classroom. ICT implementation is encouraged because it can support students' understanding which in turn enhances the quality of education. The ultimate reason for improving the quality is to enrich students' learning achievement. There are a couple of research studies that investigated the level of students' satisfaction with Plasma TV (Abera, 2013; Kim, 2015), they did not compare the students' learning outcome with ICT and without ICT implementation. An evaluation-based research can identify the most appropriate format of ICT-integrated teaching in Ethiopia.

Appendices

Appendix 1: Consent form for the Interviewees

INTERNATIONAL DEVELOPMENT
University of East Anglia

Participant Consent Form

Title of Research Project: From teacher training to the classroom: a case study of teacher training and ICT use in secondary schools in Addis Ababa, Ethiopia

Name of Researcher: In Cheol Jang

Please read and complete this form carefully. If you are willing to participate into this research, please initial all boxes and print your name and sign at the end. If you are not sure or would like to have more information, please ask.

Please initial all boxes

1. I confirm that I have read and understand the information sheet explaining the purpose of the research project and I have had the opportunity to ask questions about the project.

2. I understand that my participation is voluntary and that I am free to withdraw from the project at any stage without giving any reason and this will not affect my status now or in the future.

3. I understand that while information gained during the study may be published, I will not be identified and my personal results will remain confidential.

4. I understand that I will be audio recorded during the interview.

5. I agree to take part in the above research.

Name of Participant	Date	Signature
Name of Researcher	Date	Signature

Contact details
Researcher: In Cheol Jang
Research Assistant:

Appendix 2: Information sheet

Information sheet

Title of Research Project: From teacher training to the classroom: a case study of teacher training and ICT use in secondary schools in Addis Ababa, Ethiopia

Name of Researcher: In Cheol Jang

I am a postgraduate researcher at the University of East Anglia, in the School of International Development. I am planning to conduct a research project, which I invite you to take part in. This form has important information about the reason for doing this study, what I will ask you to do if you decide to be in this study, and the way I would like to use information you share if you choose to be in the study.

Why are you doing this study?

The purpose of the study is finding out the meanings and practices of ICT for Ethiopian secondary school teachers. Although the Ethiopian government has employed its ICT and education policy, it is always important to understand end-users' meanings and practices first to make policy successful. Thus, this study will help not only national government but also donor countries which are involved in ICT and education policy and programme.

What will I do if I choose to be in this study?

You will be asked to explain your teaching and learning experiences with ICT since your teacher training institute. This will include your course in general, material settings in lecture theatre and your current teaching practices. Once I interview you, I would like to observe your actual teaching in the classroom such as ICT used and material settings. This will not be for assessing your teaching but for simply observing your teaching with ICT. Lastly, if you allow me to see your home settings which will show ICT environment, it will help my research in terms of finding different meanings and practices in different domains.

- Study time: Study participation will take approximately 45mins to an hour interview and a couple of classroom observation. Visiting home will also be around a couple of times but I will time the observation schedule to make you feel comfortable.
- Study location: All observations will take place at either teacher training institute or secondary schools. However, it can be taken place at different locations where you feel much more comfortable.

I would like to audio-record this interview to make sure that I remember accurately all the information you provide. I will keep these digital files in password protected personal computer and they will only be used by myself and my research assistant (only with my supervision). If you prefer not to be audio-recorded, I will take notes instead. I may quote your remarks in presentations or articles resulting from this work. A pseudonym will be used to protect your identity, unless you specifically request that you be identified by your true name.

What are the possible risks or discomforts?

To the best of our knowledge, the things you will be doing have no more risk of harm than you would experience in everyday life. As with all research, there is a chance that confidentiality of the information I collect from you could be breached – I will take steps to minimise this risk, as discussed in more detail below in this form.

What are the possible benefits for me or others?

You are not likely to have any direct benefit from being in this research study. This study is designed to learn more about Ethiopian secondary schools teachers' meanings and practices of ICT. The study results may be used to help Ethiopia to utilise and practise efficient ICT material in education in the future with more appropriate way.

How will you protect the information you collect about me, and how will that information be shared?

Results of this study may be used in publications and presentations. Your study data will be handled as confidentially as possible. If results of this study are published or presented, individual names and other personally identifiable information will not be used. To minimise the risks to confidentiality, Anonymity will be achieved by using letter and numerical codes to anonymise all documentation and recordings once it has been generated. The original list of participants will be held by me (the primary researcher) only. I may share the data I collect from you for use in future research studies or with other researchers – if I share the data that I collect about you, I will remove any information that could identify you before I share it. If I think that you intend to harm yourself or others, I will notify the appropriate people with this information.

Financial Information

Participation in this study will involve no cost to you. You will not be paid for participating in this study.

What are my rights as a research participant?

Participation in this study is voluntary. You do not have to answer any question you do not want to answer. If at any time and for any reason, you would prefer not to participate in this study, please feel free not to. If at any time you would like to stop participating, please tell me. I can take a break, stop and continue at a later date, or stop altogether. You may withdraw from this study at any time, and you will not be penalized in any way for deciding to stop participation.

Who can I contact if I have questions or concerns about this research study?

If you have questions, you are free to ask them now. If you have questions later, you may contact the researchers at In Cheol Jang, telephone number (edit after buying simcard in Ethiopia), I.Jang@uea.ac.uk.

Appendix 3: Interview questions to teacher trainees

Teacher Training

What have you learned in teacher training college in relation to ICT utilisation for teaching and learning?
How did your lecturer use ICT in teaching and learning? What sort of ICT have they utilised?
Have you had a specific session/information for Plasma TV instruction?
During your practicum, have you tried to use any type of ICT? If not, what was the main barrier?

ICT Experience

On the basis of your experience, was Plasma TV instruction useful for study?
What would be the most efficient instructional ICT in Ethiopian secondary school context?
Does your university provide enough number of desktop and/or Internet access for your study?
Is it affordable to buy scratch mobile card in order to use the internet data? What is the main purpose to use mobile data?

Home

Do you have any ICT access in your home?
Let's imagine you become a teacher. How will you prepare and/or work at home if you need to use ICT materials?

Beliefs and attitudes

What is your understanding of ICT? Can you describe?
Do you think is ICT helpful to teach students?
Do you think the frequency of using ICT will determine your attitudes towards ICT?
What would be the first step to encourage teachers to use ICT in their teaching?

Appendix 4: Interview questions to teachers

Teacher Training
How was your training in the university associated with ICT utilisation for teaching and learning?
What sort of ICT have your lecturers utilised? Was it appropriate?
During your practicum, have you tried to use any type of ICT? If not, what was the main barrier?

Secondary school
What sorts of ICT materials are provided by your school for your work?
Do you use Plasma for your class? If not, what make you to hesitate Plasma TV utilisation?
What would be the difference between university (teacher training) and actual teaching and learning practices regarding ICT implementation?

Home
Did you have any type of ICT access in your home when you were young?
Can you say the previous ICT access at home influences your attitude towards ICT?
How do you prepare and/or work at home if you need to use ICT materials?

ODA (Official Development Assistance)
Does your school receive ICT supports (infrastructure, training etc.) from any NGOs or international organisations?
If not, what do you expect them to support? Why?

Perception
What is ICT in your own term?
Do you think is ICT (helpful / not helpful) for teaching and learning process? Why?
What is the most influential factor create your perception towards ICT? (infrastructure, place, experience etc.)

Recommendation
What would you recommend to encourage teachers to use ICT in Ethiopian secondary school context?

Appendix 5: A sample Transcript and Translation of an Interview

የከቲት Teacher ቢ (teacher B Yekatit 12)
ዩኒቨርስቲ(የመምህራን ሥልጠና) (university training)
ጠያቂ፡ በመጀመሪያ ስምንህንና የምታስተምረው ፡ ት/ት ባጭሩ ንገረን?
ተጠያቂ፡ ስማ ጋሸውበዛ ተደሰ ነው. የመስተምረው ሂሳብ ነው፡ የማስተምረው 11 ምም 12 የስራ ልምድ ዘጠ አመት ነው፡
ጠያቂ፡ በዩኒቨርስቲ ስልጠና ወቅት የ ICT አጠቃቀም (ለመማር ማስተማር) ምን ይመስል ነበር?
ተጠያቂ፡ በኔ ጊዜ ነው?
ጠያቂ፤ አዎን አንተ ዩኒበርስቲ በምትማርበት ጊዜ?
ተጠያቂ፡ ICT በቲዮሪ ትምህርት ነበር ፡፡ በአንድ ወይም በሁለት ክረዲት ሰአት ኮርሶች ነበሩ፤ በ1998 ያ ከሆነ ሞባይል ፤ ICT አልነበረም፤፤ አክሰሱ አልነበረም፤፤
ጠያቂ፤ መምህራኖቹ (ሌክቸረሮቹ) የሚጠቀሙት ምን አይነት ICT ነበር?
ተጠያቂ፡ አይጠቀሙም ነበር፤ ፕሮጀክተር አንካን አይጠቀሙም፤፤ ፓወርፖይንት ግን ብዙ አልነበረም፡፡
ጠያቂ፤ ስለዚህ ICT አይጠቀሙም ነበር፤ ትክክል ነበር ብለህ ታስባለህ/?
ተጠያቂ፡ ትክክል አይደለም ግን ምክንያቱ ችግሩ ነው…..
ጠያቂ፤ ለማሰተማር ልምምድ(practice) በወጣህ/ሽ ጊዜ ለትምህርት የሚረዳ(Instructional Technology) ለመጠቀም ሞክረሃል?
ተጠያቂ፡ ፕላዝማ ለመጠቀም ሞክሪያለሁ፤ ስለነበረ፡፡

ሁለተኛ ደረጃ (secondary school)
ጠያቂ፡ አሁን ወደ ትምህርት ቤት …ለስራህ ምን ዐይነት የ ICT ማቴሪያሎች በት/ቤቱ በኩል ይቀርባሉ?
ተጠያቀ፡ የICT ማትሪያል -ፕላዝማ ብቻ ይቀርባል፡፡
ጠያቀ፡፡ ለምታስተምርበት ክፍል ፕላዝማ ትጠቀማለህ?
ተጠያቂ፡፡ አዎን አንዳንዴ
ጠያቂ፤ ለምን አንዳነዴ?
ተጠያቂ፡፡ ሰርጭቱ ስለሚቀረጥ የፕላዝማ ፕሮግራም፡፡
ጠያቂ፤፤ ፕላዝማ እንዳትጠቀም ምን አደረገህ/?
ተጠያቂ፤፤ ፊገሪካል ነገሮችን ለማሳየት ከመሳል -ብላክቦርድ ላይ ከምስል….
ጠያቂ፤ ከፕላዝማ አጠቃቀም ጋር በተያያዘ ያሉ ችግሮች ምንድን ናቸዉ? (problem of plasma instruction)
ተጠያቂ፡፡ብዙ ችግሮች አሉ፤፤ ለምሳሊ፤፤ የፕላዝማ አቀማመጥ፤ የመብራት መጥፋት ፤፤ ሰት ፍ ቦክሶች መሰረቀ፤፤ ትምህርቱን አለማግ ት፡፡

Translation of Teacher B interview (Yekatit 12)

University (Teacher Training)

Interviewer: Ok, thank you very much, would you introduce yourself briefly –your name and the subject you teach….?

Interviewee: ok, my name is…. I teach Mathematics, grdae 11 (-hmm 12) and my work experience is nine years…

Interviewer: How was your training in the university associated with ICT utilisation for teaching and learning?

Interviewee: Ok, Only myself or?

Interviewer: When you were in university…

Interviewee: ICT , only theoretical lesson, only 1 or 2 credit hours courses So In 1998…E.C in the case No mobiles, no enough access, there was no ICT, only lecture methods…Today ICT is available…

Interviewer: What sort of ICT have your lecturers utilized while you were in university?

Interviewee: They were not using, even projectors…, power pint but not very much.

Interviewer: So, theirs' not using, do you think it was appropriate?

Interviewee: It was not appropriate; it is because of the problem…

Interviewer: During your practicum, have you tried to use any type of instructional technology?

Interviewee : I used plasma, in my time there was plasma…

Interviewer: Now let's move to second part while you teach at schools. What sort of ICT materials are provided by your school (Yekatit Preapartory school) for your work?

Interviewee: ok, only Plasma is provided…

Interviewer: Do you use Plasma for your class?

Interviewee: I use sometimes. There is distraction in the transmission in the plasma program…

Interviewer: What makes you to use it?

Interviewee: To show some figure cal things to the students easily ,,,instead for me to draw

Interviewer: What problems are there in plasma instructions?

Interviewee: There are a lot of problems, for example, its sitting position, light off, set off boxes are stolen by students.. You may not find the lesson..

Interviewer: What would be the gap between university (teacher training) and actual teaching and learning practices regarding ICT implementation?

Interviewee: In the university teachers were not using you said and high school?

Interviewer: Do you think there is a gap between the two in usage of ICT?

Interviewee: There is a gap.

Appendix 6: Interview questions to organisations (DFID)

Overarching questions
Would you explain DFID's education projects in Ethiopia?

ICT-related programme
Does DFID work on any ICT-related programme? e.g. provision of materials / giving training etc.

In DFID's perspective, what would be the most urgent issue which Ethiopian ICT education has to solve? For instance, infrastructure, training, appropriate policies, raise of Awareness

According to DFID plan, are there any ICT-related education projects in Ethiopia in the future?

<General Education Quality Improvement Project>

What is the role of DFID in relation to GEQIP?
As one of the major funding bodies of GEQIP, which specific area does DFID focus on?
What is the process of making GEQIP policy? (with whom and based on what data)

<Challenge>

Does DFID face any challenges when you implement educational projects in Ethiopia?

Appendix 7: Ethical Research Approval

Guidance on ethics is available in the International Development Ethics Handbook and on the UEA website http://www.uea.ac.uk/dev/ethics Please consult these sources of information before filling this form.

HOW TO COMPLETE THIS FORM

- Your application **MUST** include a **separate** Consent Form
- **COMPLETE** all sections of the form (including the top section of PART B)
- Submit the documents as **WORD** files (PDFs are NOT accepted)
- You **MUST** have your **SURNAME** in the electronic name of any documents you submit
- Your **supervisor must have approved** your two forms (ethical clearance application + consent form)
- **BEFORE** submitting your ethics form you must have submitted a Risk Assessment form, signed off by you and your Supervisor, to the Learning and Teaching Hub in Arts 1.

SUPERVISOR APPROVAL

Your ethics application **MUST** be reviewed, commented on and **APPROVED** by your Supervisor **BEFORE** submitting.   How to confirm approval?

- The Supervisor attaches an electronic signature to your ethics form

OR

- The Supervisor emails dev.ethics@uea.ac.uk to confirm approval of your application

OR

- Your Supervisor confirms approval to you (via email) you include it in the application materials emailed to dev.ethics@uea.ac.uk

WHEN TO SUBMIT?

Deadline: for each month is **10th**.
Please be aware that it usually takes 1 to 2 months to be granted ethical approval.

WHO TO SUBMIT TO?

Email: dev.ethics@uea.ac.uk

PLEASE BE AWARE THAT FORMS THAT ARE NOT COMPLETED CORRECTLY OR ARRIVE WITHOUT AUTHORISATION FROM YOUR SUPERVISOR WILL BE REJECTED.

After review, if you are asked to **resubmit your application** follow the guidance in Part B

PERSON(S) SUBMITTING RESEARCH PROPOSAL

Name(s) of all person(s) submitting research proposal. Including main applicant	Status (BA/BSc/MA/MSc/MRes/ MPhil/PhD/research associate/faculty) Students: specify your course	Department/Group/ Institute/Centre
In Cheol Jang	PhD	DEV

APPLICANT INFORMATION

Forename	In Cheol
Surname	Jang
Gender	Male
Student ID number *(if applicable)*	100092474
Contact email address	I.Jang@uea.ac.uk
Date application form submitted	15th September 2016
1st application or resubmission?	resubmission

PROJECT INFORMATION

Project or Dissertation Title	From teacher training to the classroom: a case study of teacher training and ICT use in secondary schools in Addis Ababa, Ethiopia

** DEV/DEVco faculty or DEVco research associate applications only:*

* Project Funder	
* Submitted by SSF or DEVco?	
If yes – Project Code:	

Postgraduate research students only:

Date of your PP presentation	8th July 2016

1. OVERVIEW OF THE STUDY

Describe the purposes of the research/project proposed. Detail the methods to be used and the research questions. Provide any other relevant background which will allow the reviewers to contextualise your research or project activities. **Include questionnaires/checklists as attachments, if appropriate.**
The purpose of the study is to explore the meanings and practices of Information and Communication Technology (henceforth ICT) in teaching and learning for Ethiopian secondary school teachers. This came out of my Master's research that investigated the challenges of ICT for education in Ethiopian context. At the centre of this research is understanding how Ethiopian secondary school teachers are being trained about ICT in teacher training college and are practicing it in the classrooms. That is why speaking to and representing different teachers' opinions and experiences is most importance to the design and conducting of this research. Research Questions: The overarching question in the research is; What are the meanings and practices of ICT in teaching and learning for Ethiopian secondary school teachers? This will be explored via three secondary questions: 1. How are the perceptions and uses of ICT for secondary teachers shaped by the domains of the school, home and teacher training college? 2. How do teacher training institutes equip their students for their teaching with ICT? 3. How are ICT material practices and socio-environments in Ethiopian secondary schools being influenced by ODA? Research Design: The majority of the research will take place at Addis Ababa in Ethiopia. I will spend approximately six months at Addis Ababa from November 2016 to May 2017. I will stay at guest house which locates near Addis Ababa University that will help me in terms of accessing my research domains (teacher training college, school and home) and general logistics.

1. OVERVIEW OF THE STUDY

I will firstly be in touch with international organisations or donor agencies that work in Ethiopia. This will enable me to understand the overview of current ODA programme associated with ICT in education in Ethiopia. This will also provide me more chances to have access to teacher training college and secondary schools.

I am going to prepare visa for this research in South Korea because this will make me relatively easier than England. While staying in South Korea, I will conduct a few interviews in the Korean International Cooperation Agency (KOICA) and interview committee member of International Development Cooperation Committee (IDCC) who are involved in this ODA policy. It is because South Korea, has recently initiated a five-year ODA framework for ICT in education in Ethiopia.

In three research domains, semi-structured in-depth interviews will be conducted with university students (student teachers) and secondary school teachers. The interviews with them will start with uncomplicated factual questions, such as 'what do you teach?' followed by detailed ones ('how was your teacher training in relation to ICT?'). I will also ask how their roles as teachers have been influenced before, during and after teacher training, and whether they think whether teacher training have been useful to them in reference to teaching practices.

In-depth interviews will also be held with International organisation or donor agencies in Addis Ababa such as WB, UNESCO, KOICA, JICA and DFID. They will be selected because their ODA programmes will shape material practices and socio-environment in Ethiopian secondary schools.

Gaining access to aforementioned organisations, will be aided by a professor at Korea University (my supervisor when I studied at that university) who has teaching and research experiences in Addis Ababa and my links with previous work experiences.

Participant observation will take place in three different research domains (school, home and teacher training college) which will affect teachers in different ways because teachers are exposed to different circumstances and encounter different relationships when they are in different domains.

With regard to language issue, the interpreter will assist me in terms of conducting interviews when interviewees are not able to communicate in English. Although I will learn a basic level of Amharic (Ethiopian official language), it will be impossible to conduct interviews without having an interpreter. The consent form and verbal explanation of research will also be translated and introduced by interpreter. To find a reliable interpreter, I will ask the KOICA Ethiopia office.

1. OVERVIEW OF THE STUDY

Participants' responses will be recorded using an iPhone and recorder, if they agree to this, otherwise notes will be taken by hand. Verbal consent to participate will be sought from each participant when necessary and for the right to digitally record proceedings. If interviews are conducted in Amharic, all recordings will be translated into English and transcribed, following which, data will be analysed using a Nvivo.

2. SOURCES OF FUNDING

The organisation, individual or group providing finance for the study/project. If you do not require funding or are self-funded, please put 'not applicable'
Not applicable

3. RISKS OR COSTS TO PARTICIPANTS

What risks or costs to the participants are entailed in involvement in the study/project? Are there any potential physical, psychological or disclosure dangers that can be anticipated? What is the possible benefit or harm to the subject or society from their participation or from the study/project as a whole? What procedures have been established for the care and protection of participants (e.g. insurance, medical cover) and the control of any information gained from them or about them?
There will be several issues to consider especially for research participants. First and foremost, recently, there have been unrest in Ethiopia because people in Oromia region have thought that they are politically and economically marginalised from the federal government. The demonstration happens in the capital city, Addis Ababa over the first weekend of August, 2016. Under the Ethiopian anti-terrorist law, people will be arrested if they publically (through SNS or the Internet) express their political dissent. Although I will interview my participants in person, I should be aware of avoiding political-related question. If I have to ask something about the current government, I will let my participants know the interview will not publicise neither in written form nor on the Internet. In addition, I will visit them to get a confirmation for using any quotes in my thesis.__   This being so, it is important to gain consent not only from research participants but also from the teacher training college and secondary schools where they belong. When the organisations give their consent, then individual members such as student teachers and secondary school teachers will be approached and asked if they consent to taking part in the in-depth interviews. In some cases, I (the researcher) need to be sensitive to power relations among teachers and junior teachers may feel obliged to take part in the research. I need to therefore ensure that all respondents are happily volunteering to take part in the research. In addition, participants will be reminded of their rights to withdraw at any point if they feel uncomfortable or unsafe because of certain issues.

3. RISKS OR COSTS TO PARTICIPANTS

The issue of home setting research may be approached slightly different way. Although teachers or student teachers allow me to conduct participant observation in their home, I should gain consent from other family members. In particular, ladies or girls may feel uncomfortable with male researcher so that I will consider gender composition of home setting research with female research assistant. This difference may influence to the process of interview or findings from the participant observation. Thus, interviews and fieldnote will be carefully recorded and the characteristics of home settings will be considered during data analysis.

Issues also might arise in relation to why some schools or families have been selected to take part in the research and others have not. Hence, members of schools or families who are not in the research may start to become concerned, curious or even jealous of those that have been selected to take part in the study. This may stir up unwanted attention from outside of their schools or families because others might think that they will get the benefit by participating into my research. To avoid participants experiencing discomfort due to unwanted attention, the Issues of disclosure are addressed by giving each respondent verbal and/or written (depending on the participant's needs) assurance of their anonymity and that all information exchange will be confidential. Above all, I will clearly explain and let other people know my participants will not get any benefits from myself or the government.

The safety of respondents' information is also important. Hard copies of notes and interviews will be kept locked in my room, in Addis Ababa during fieldwork. All the electronic data such as voice recording and transcribed interview will be kept in password protected on my personal computer. Above all, letter and numerical codes will be given by myself for their anonymity even before handing over to research assistant. With regard to recorded interviews, I will edit the first part (participants' introduction) of recording file to anoymise paraticipants.

4. RECRUITMENT/SELECTION PROCEDURES

How will study/project participants be selected? For example will participants be selected randomly, deliberately/purposively, or using lists of people provided by other organisations (see section 11 on Third Party Data)?

Recruitment

I will work with research assistant especially when my research participant cannot communicate in English. I would prefer to work with female assistant because it will be good

4. RECRUITMENT/SELECTION PROCEDURES

research team in terms of gender composition. This maybe helpful when I interview female teachers and visit female teachers' home or talk with female in the home settings. Although the assistant does not have university qualification, it is crucial for the assistant to speak fluent English and have a few research experiences particularly interview and translation. I will ask KOICA regional office to recommend me the assistants and decide after having short interview with them.

Schools selection

Approximately 10 secondary schools will be randomly selected from 308 schools across the city of Addis Ababa, with one school to be selected from each sub city to avoid region-biased outcomes.

Participants selection

With regards to interviewees (teachers and student teachers), my research has to have participants who have had teacher training with integration of ICT. In other words, they will be selected on the grounds of their experience of ICT in their training and ICT related experience in their teaching practices. In the case of donor agencies' interview, gaining access will be aided by the researcher's previous experience of working in the area. Beyond this, other accesses to participants will be introduced by KOICA or MCM Korean hospital in relatively informal way.

Donor agencies selection

I have already contacted a few donor countries' regional offices (KOICA, JICA and DFID) which have been involved in the ICT educational programme in Ethiopia. However, I will ask them to introduce me to other donor agencies or international organisations working in ICT-related programmes.

5. PARTICIPANTS IN DEPENDENT RELATIONSHIPS

Is there any sense in which participants might be 'obliged' to participate – for example in the case of project beneficiaries, students, prisoners or patients – or are volunteers being recruited? If participants in dependent relationships will be included, what will you do to ensure that their participation is voluntary?

Respondents (student teachers in university and secondary school teachers) taking part in this study will not include young students who are under the age of 18 or others in dependent relationships. However, if there are potential participants in dependent relationship, I will inform them separately to let them know their rights in my research.

6. VULNERABLE INDIVIDUALS

Specify whether the research will include children, people with mental illness or other potentially vulnerable groups. If so, please explain the necessity of involving these individuals as research participants and what will be done to facilitate their participation.
No children under the age of 18 will be part of this study. The researcher will however, include university students to have their current experiences and opinions on the topic. It is the responsibility of the researcher to be particularly sensitive with regard to participation of university students without coercion from anybody.

7. PAYMENTS AND INCENTIVES

Will payment or any other incentive, such as a gift or free services, be made to any participant? If so, please specify and state the level of payment to be made and/or the source of the funds/gift/free service to be used. Please explain the justification for offering payment or other incentives.
Respondents will not receive any immediate benefit from taking part in this study. For example, I will not offer any financial reward and there will not be any transport costs incurred by the respondents as I will go to them. I hope that respondents will enjoy being a part of my research and talking to me about the topic. However, I am thinking of giving small present (Korean traditional bookmark) to show my gratitude for their time and efforts. Nevertheless, I will take advice from my research assistant about the impression of giving gift in Ethiopia.

8. CONSENT

Please give details of how consent is to be obtained. Participants must be aware of their entitlement to withdraw consent and at what point in the study/project that entitlement lapses. A copy of the proposed consent form, along with a separate information sheet, written in simple, non-technical language MUST accompany this proposal form as an **ATTACHMENT**.
I will contact organisations, which I will conduct data collection, to explain my project and gain consent to conduct my research. For people that I intend to interview, I will visit them and explain the research to them. When participants do not speak English I will be there with my interpreter (research assistant) in order to give the same level of information. I will then give them a couple of days to consider whether they would like to take part in the research, then I will return to gain their formal consent. Nonetheless, when I return I will ask the respondent to give verbal consent. I will note down the date, time, and the demographic identifier in a notebook kept for verbal consent recordings.

8. CONSENT

Although I have a chance to have informal type of interviews, I will commence conversation after seeking verbal consent from interviewees. For example, I will minute the date, time, location and demographic details of participants.

9. CULTURAL, SOCIAL, GENDER-BASED CHARACTERISTICS

What consideration have you given to the cultural context and sensitivities? How have cultural, social and/or gender-based characteristics influenced the research design, and how might these influence the way you carry out the research and how the research is experienced by participants? For example, might your gender affect your ability to do interviews with or ask certain questions from a person of a different gender; might it affect the responses you get or compromise an interviewee? How might your position /status as a UK university based researcher affect such interactions?

Before research begins, the permission of teacher training institutes and secondary schools will be obtained to carry out the research. The research is concerned with exploring the secondary school teachers' and student teachers' different meanings and practices of ICT experiences and this will be done in a culturally sensitive way. Due to meanings and practices being influenced by culture and context, it will be necessary to think the way in which I can engage with research participants.

I am aware that my positionality as a South Korean, Asian, male researcher is likely to influence my research, particularly in what people want to tell me and how they want to tell me. First and foremost, research participants may think that I am working for South Korean government or associated with their national government. To this regard, they may think that the researcher (myself) will have the 'right' answer or 'expected' answer from them. Hence, respondents possibly do not give their actual thoughts and I need to be aware of this possibility. That is why I need to clarify that myself and my research will have nothing to do with neither South Korean government nor Ethiopian government. After making clarification, I hope that respondents may reveal their true thoughts. Moreover, as I mentioned earlier, I will work with female research assistant particulary when I have a plan to visit female teachers' (student teachers') home to make themselves comfortable while I conduct participant observation or interview at their living spaces.

Although I have been in Addis Ababa, Ethiopia for research, it has less than a month so that I was not exposed to Ethiopian culture thoroughly. Apart from gender-based issue, my research assistant will let me know what I can do and cannot do in the Ethiopian context. In addition, research assistant will be introduced by KOICA Ethiopian regional office.

9. CULTURAL, SOCIAL, GENDER-BASED CHARACTERISTICS

Cultural and social-based characteristics are not possible to understand unless researcher experience and spend his/her time in the field. Nonetheless, preparation and communication need to be concerned deeply before I embark upon my research. In addition, I will pay attention to cultural and behavioural norms while I am conducting my research. However, respondents must be treated with the upmost respect because this type of respect may not be familiar to them in Ethiopian context. Therefore, their rights as research respondents will be introduced once they become my participants as well as potential participants.

10. CONFIDENTIALITY

Please state who will have access to the data and what measures which will be adopted to maintain the confidentiality of the research subject and to comply with data protection requirements e.g. will the data be anonymised?

With regard to accessing to the raw data, myself and my research assistant will only know the identity of research participants. All data will be made anonymous and this will be made clear to them before their participation in the research commences.

Anonymity will be achieved by using letter and numerical codes to anonymise all documentation and recordings once it has been generated. The original list of participants will be held by me (the primary researcher) only. My research assistant will be trained in matters of anonymity and confidentiality. He/She will have access to primary data only when necessary and only in anonymous form, such as when discussing data.

11. THIRD PARTY DATA

Will you require access to data on participants held by a third party? In cases where participants will be identified from information held by another party (for example, a doctor or school) describe the arrangements you intend to make to gain access to this information.

Access to data as a third party is not required for this research.

12. PROTECTION OF RESEARCHER (THE APPLICANT)

Please state briefly any precautions being taken to protect your health and safety. Have you taken out travel and health insurance for the full period of the research? If not, why not. Have you read and acted upon FCO travel advice (website)? If acted upon, how?

A number of measures have been taken to ensure the security and wellbeing of me (the researcher) while conducting my fieldwork in Ethiopia. Firstly, I am fully up to date with all vaccinations, medication to take while in Ethiopia and will have fully comprehensive medical and travel insurance. Insect repellent, a bed net and malaria tablets will be used as precautionary measures from the dangers of mosquito bites.

12. PROTECTION OF RESEARCHER (THE APPLICANT)

In relation to cultural aspect, secondly, I will respect local customs, dress code, behaviour and attitude and those will be observed at all times. When it comes to contact points, thirdly, the UEA will have details of the address where I will be living during fieldwork, as well as contact details for KOICA Ethiopian office which introduce my research assistant and practically help me. At the same time, my emergency contacts in three countries South Korea, Ethiopia and England will be given KOICA regional office and MCM Korean hospital. On top of this I will be regularly contact with both my supervisors at UEA throughout my fieldwork not only for reporting progress but also for having supports. Fourthly, with regard to insurance, I will keep photocopies of related document in secure places but put original copy in different place. The luggage, electronic equipment and cash will be kept to a minimum in order to prevent myself from facing potential crime. Lastly, I have checked FCO and Ministry of Foreign Affair (South Korea) related to stability in Ethiopia. The region where I conduct the research (Addis Ababa) is fine to travel after checking the advice provided by FCO and MOFA. Nonetheless, I will guest house run by South Korean to ensure my safety.

13. PROTECTION OF OTHER RESEARCHERS

Please state briefly any precautions being taken to protect the health and safety of other researchers and others associated with the project (as distinct from the participants or the applicant). If there are no other researchers, please put 'not applicable'
My research assistant will follow the same precautions as me (as above), in terms of respecting local customs, dress code, behaviour and attitude at each domain. On top of this he or she will be paid and food provided while assisting my research.

14. RESEARCH PERMISSIONS (INCLUDING ETHICAL CLEARANCE) IN HOST COUNTRY AND/OR ORGANISATION

The UEA's staff and students will seek to comply with travel and research guidance provided by the British Government and the Governments (and Embassies) of host countries. This pertains to research permission, in-country ethical clearance, visas, health and safety information, and other travel advisory notices where applicable. If this research project is being undertaken outside the UK, has formal permission/a research permit been sought to conduct this research? Please describe the action you have taken and if a formal permit has not been sought please explain why this is not necessary/appropriate (for example, for very short studies it is not always appropriate to apply for formal clearance).
I will have an affiliation with Institute of Educational Research, Addis Ababa University that help me to get official research permit in Ethiopia.

15. MONITORING OF RESEARCH

What procedures are in place for monitoring the research/project (by funding agency, supervisor, community, self, etc.).
Research activities will be recorded daily in my fieldwork diary. I will ensure that I will contact with my supervisors at UEA once a month and send monthly summary and progress reports to ensure that I remain on target to complete my research.

16. ANTICIPATED USE OF RESEARCH DATA ETC

What is the anticipated use of the data, forms of publication and dissemination of findings etc.?
The data generated from this study will be only used for my PhD thesis, conference presentations and related journal publications.

17. FEEDBACK TO PARTICIPANTS

Will the data or findings of this research/project be made available to participants? If so, specify the form and timescale for feedback. What commitments will be made to participants regarding feedback? How will these obligations be verified?
Respondents will be made fully aware of my status as a research student who is currently learning to conduct research. I will give an estimation of the timescale in relation to my research completion. The data generated from this research will not be made available directly to respondents, but I will summarise the overall findings of my research and distribute to participants through research assistant.

18. DURATION OF PROJECT

The start date should not be within the 2 months after the submission of this application, to allow for clearance to be processed.

Start date	End date
24th October 2016	24th May 2017

19. PROJECT LOCATION(S)

Please state location(s) where the research will be carried out.
Seoul in South Korea (a few interviews and visa preparation) and Addis Ababa in Ethiopia

REVIEW REPORT AND DECISION - PART B

UNIVERSITY OF EAST ANGLIA
INTERNATIONAL DEVELOPMENT RESEARCH ETHICS COMMITTEE

To be completed by the applicant

Forename	In Cheol
Surname	Jang
Student ID number *(if applicable)*	100092474
UG, PGT or PGR *(if applicable)*	PGR
Supervisor *(if applicable)*	Dr Lucio Esposito / Dr Bryan Maddox
Project Title	From teacher training to the classroom: a case study of teacher training and ICT use in secondary schools in Addis Ababa, Ethiopia

RESUBMISSIONS – IF YOU ARE ASKED TO RESUBMIT YOUR APPLICATION FOLLOWING REVIEW BY THE COMMITTEE PLEASE ALSO ATTACH **A LETTER** WITH YOUR REVISED APPLICATION DETAILING HOW YOU HAVE RESPONDED TO THE COMMITTEE'S COMMENTS. Students please ensure your supervisor has approved your revisions before resubmission.

REVIEWERS' RECOMMENDATION (✓)

To be completed by the Ethics Committee

Accept	✓
Request modifications	
Reject	

REVIEWERS' CHECKLIST

Delete as appropriate

Risks and inconvenience to participants are minimised and not unreasonable given the research question/ project purpose.	✓	
All relevant ethical issues are acknowledged and understood by the researcher.	✓	
Procedures for informed consent are sufficient and appropriate	✓	

REVIEWERS' COMMENTS

COMMITTEE'S RECOMMENDATION

The International Development Ethics Committee Chair has reviewed your revised and resubmitted application for ethical clearance to do research in Addis Ababa, Ethiopia. The Chair notes that you have addressed the most important concerns raised by the original application and approves this application.

COMMITTEE'S RECOMMENDATION

When you are in Ethiopia, please remember to keep in mind the original review's comments about the ethics of the research. Please keep this form for your records.

SIGNATURE (CHAIR OF THE INTERNATIONAL DEVELOPMENT ETHICS COMMITTEE)

Signature	Date
Steve Russell	16th September 2016

Appendix 8: Risk Assessment Form

RISK ASSESSMENT FORM: UG and PG Field Study

Student Name	**In Cheol Jang**
Email Address	**I.Jang@uea.ac.uk**
Status	BA/BSc MA/MSc MPhil/PhD Research Associate/Post-Doc
Type of Work	Dissertation DWE/OSU PhD Research Project Other
Supervisor(if applicable)	**Dr Lucio Esposito and Dr Bryan Maddox**
Location *(Fieldwork ite)*	**Addis Ababa, Ethiopia**
Dates	**24 / 10 / 2016 – 23 / 06 / 2017**

Detailed description of intended activities *(attach separate sheet(s) if necessary)*:

The main objective of my research is examining the meanings and practices of ICT for secondary school teachers. To find the meanings and practices, I will conduct the research in three different domains: 1) teacher training college; 2) secondary school; 3) home. It is because teachers will have different meanings and practices depending on domains. Moreover, I will look into the influence of donor agencies, which run ICT-related educational programmes, to teachers through material settings. This leads me to conduct the research at donor agencies' regional offices in Addis Ababa.

Supervisory arrangements (communication, local supervision) **:**

I will communicate with my two supervisors mainly via email on a monthly basis. Moreover, I will let my supervisors know my local mobile phone number in order to discuss something more promptly such as through What's app (mobile messenger application). I will be affiliated with Institute of Educational Research at Addis Ababa University. Dr Abera, who is assistant professor, has similar research interest with me. Thus, we will be able to work together.

Has a reporting procedure been set up? Yes/No? We do have agreed that we will keep in touch on a monthly, but the precise way in which this will happen will depend on my facilities. We have in place a variety of ways to keep in touch, such as email, Skype and Whatsapp.

Is special training required............Yes/No? If 'Yes', give details**:**

Describe medical arrangements (vaccinations, access to health care in field)**:**

I have been to Ethiopia in 2013 to conduct my research for two weeks. For that research, I was vaccinated against yellow fever which was an essential vaccination to travel Ethiopia. Therefore, I do not need to schedule medical arrangement particularly for vaccinations. With regard to the access to health care, there is a Korean hospital (Myung Sung Christian Medical Centre) in Addis Ababa. As a Korean, it is therefore relatively easy to access health care while I will be in Ethiopia.

Is Medical Insurance arranged? Yes/No

Are there any pre-existing medical conditions that require special attention during field work? Yes/No

If yes, please confirm that your doctor has agreed required actions:

Foreign and Commonwealth Office travel advice consulted? (Specify any locations you will need to avoid)

Although FCO says crime in Ethiopia will be low, people should be vigilant at all times. In particular, it is important to be aware that there have been a few demonstrations in the Oromia, which surrounds Addis Ababa, and Amhara regions in 2016. Due to those demonstrations, the Ethiopian government occasionally blocks information and communication technologies such as telephone and the Internet. FCO advises people to avoid large crowds at all times.

RISK ASSESSMENT GRID

The form below is intended as a summary of a discussion between you and your supervisor. The general process for this is to identify hazards and identify ways of reducing the risk as much as possible (at least to an acceptable level). ***Your assessment must, as a minimum, cover the following hazards: road accidents, illness, crime.***

Hazard Identified	Actions Required to Reduce Risk to an Acceptable Level	Person(s) responsible for actions
Political unrest	**As FCO advised, I need to avoid any large crowds in Ethiopia. Although foreigner will not be treated as a local Ethiopian, it is always worth to avoid large crowds particularly associated with political demonstration.**	**Researcher**
Illness	**I have been vaccinated against yellow fever in 2013 which lasts 10 years. Nevertheless, there may be a chance to be sick during my research in Ethiopia. I know a director of Korean hospital in Addis Ababa who can help me if I need the access to the medical care.**	**Researcher and doctor in Korean hospital**
Crime	**According to FCO, petty theft and mugging is common in Ethiopia. It warns people need to take care their personal belongings when they visit crowded public places.**	**Researcher**

Supervisor's Comments About Risks

I believe that risks hazards are well taken into account. In Cheol will be officially visiting researcher in Addis Ababa University and will be well connected. He has also been in the country before. Therefore, while certainly the identified as well potentially other risk sources should never be underestimated, I feel that the PhD student has done all he could to minimise the likelihood of potential problems.

Participant's Signature:	**In Cheol Jang**	Date:	**26.09.16**
Supervisor's Signature:		Date:	**25.09.16**

Students: This form should be completed and signed by you. Once complete you will need to meet with your Supervisor to discuss the contents and obtain the Supervisor's signature confirming that this RA is acceptable and complete. Once you have obtained your Supervisor's signature, you **<u>MUST</u>** return the original form to the Learning & Teaching Hub.

Supervisors: Please review the contents of this form and then if agreed, sign and return the completed form to the Student. Any queries that you cannot resolve with the student must be referred for further discussion to the DEV Safety Co-ordinator, Ben D'Exelle. Please note that this form will not be subject to further review after you.

Revision: Jan 2012

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