Improving the Teaching Staff Capacity to Integrate EdTech in the Teaching and Learning Processes at Eduardo Mondlane University

By

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Student number: MTXMAR011

Complete dissertation presented in partial fulfillment of the requirements for attribution of the Master's degree in the area of Educational Technologies.

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June, 2022

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Abstract

Eduardo Mondlane University (UEM) has been implementing training courses in the use of technologies in the teaching and learning process. However, despite the efforts made by the university, the use of these technologies by lecturers at UEM is limited, particularly in faculties outside the main campus. In response to the above-mentioned problem, a new multifaceted, constructivist approach was implemented at UEM, referred to here as the EdTech sub-program.

This thesis is the result of the investigation of the effect of the new approach to integrating educational technology at UEM. In 2019, a series of four workshops were piloted through the EdTech sub-program with the purpose of promoting the use of educational technology by lecturers in teaching and learning. This qualitative study was carried out in four faculties.Semi-structured interviews were conducted with 17 participants: 15 lecturers, who took part in the workshops of the EdTech sub-program, distributed across four faculties (Education, Veterinary, Engineering and Sciences) and two members from the EdTech sub-program.

Three theories have been explored in this study. The workshops were based on social constructivist learning theory where participants (lecturers) were encouraged to create learning activities in a real-world setting to design learning activities in an authentic context.. Despite this theory-informed workshop design, lecturers did not all change their practice. This can largely be explained by the fact that the participants are adult and had varied skills with educational technology; they felt their courses were too complicated to be delivered only online; assessment structures were not clear; and some lecturers were resistant to change. The second theory is adult learning theory. This theory focuses on the “characteristics” of adult learners and what they bring to the learning process in the form of their experiences, which helps to explain the diverse response to the workshop.

Community of practice theory was used as the third theory to explain how some faculties were willing to embrace educational technology and had history with previous projects. In these examples participants shared understandings concerning what educational technology is and how they have motivated other colleagues to use it.

Barriers can be overcome through collaboration between the most active users and the most resistant ones to motivate them to use and promote a community of practice of educational technology users. Key findings also indicate that there is a certain resistance among lecturers to the use of educational technologies, justified by the complexity of courses in some disciplines; however, there are also lecturers who rely on technologies in their teaching practices and report that the results are satisfactory and encouraging.

Dedication

I would like to dedicate this thesis to my husband Silvio Tovo, and my two children, Kelven and Ciara. They have been my source of motivation and inspiration.

Acknowledgments

Thanks God for always being with me. My thanks are extended to my supervisors, Glenda Cox and Tony Carr, who guided me during this Master's degree. Many thanks to Elódia, and her supervisor, Tabisa, who were present throughout the training process.

Compulsory Declaration

I, Marisa Mate, hereby declare on my honor that this thesis has never been submitted for evaluation at any university and that it is the result of my work and dedication.

Declaration by candidate for the degree of Master in the Faculty of Humanities

I, Marisa Jeremias Mate of 70 Nkobe, Matola, Maputo, Mozambique, do hereby declare that I empower the University of Cape Town to produce for the purpose of research either the whole or any portion of the contents of my dissertation entitled: **IMPROVING THE TEACHING STAFF CAPACITY TO INTEGRATE EDTECH IN THE TEACHING AND LEARNING PROCESSES AT EDUARDO MONDLANE UNIVERSITY**.

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List of Abbreviations and Acronyms

CAA	Computer-assisted assessment
CAD	Academic development center
CILT	Center for Innovation in Learning and Teaching
CIUEM	Centro de informática da Universidade Eduardo Mondlane
CMS	Courses management system
EDU	Education
ENG	Engineering
ET	Educational Technology
ETT	Education technology initiatives
HEIs	Higher education institutions
HE	Higher education
ICT	Information and Communication Technology
MINED	Ministerio da educacao
MOOCS	Massive open online courses
PD	Professional development
PHEA	Partnership for higher education in Africa
RTPP	Research training partner program
SCI	Science
SD	Staff development
SIDA	Swedish International Development Cooperation Agency
TV	Television
UCT	University of Cape Town
UEM	Universidade Eduardo Mondlane

UK United Kingdom

US United States

USA United States of America

VET Veterinary

CHAPTER 1: Introduction to the study

1.1 Introduction

This study investigates the impact of the Educational Technology (EdTech) sub-program for academics at Eduardo Mondlane University (UEM) piloted in 2019. As part of the EdTech-UEM sub-program, coordinated by CIUEM, with direct partnerships with the Faculty of Education at UEM and the Center for Innovation in Teaching and Learning (CILT) at the University of Cape Town (UCT), workshops were planned and implemented in the context of the possibilities of expanding blended learning (Program UEM-SIDA, 2017).

EdTech is a sub-program that connects ICT training with pedagogy, and specifically with continuous training strategies for building research and teaching capacity through the use of educational technologies. This sub-program is part of the partnership programme: UEM-Swedish International Development Cooperation Agency (SIDA). The main research question for this project is about the design and impact of the EdTech model and activities for training lecturers in the use of technology for teaching, learning and research.

The purpose of the EdTech-UEM project is to enhance the capability of Eduardo Mondlane University to conduct and disseminate high quality research and to teach and supervise the next generation of Mozambican professionals and researchers (Program UEM-SIDA, 2017).

Face-to-face sessions in workshops for university staff consisted of 2-3 half-day periods over 3-5 days, depending on the topic. Workshops also included online activities for completion by participants between face-to-face sessions. Training on campuses outside Maputo would be given in two workshops for different groups over the same number of days. Scheduling was done in coordination with the host faculties or campuses, to facilitate maximum participation without affecting normal activities (Ibid).

Unfortunately, Covid-19 changed the principle that had been established at the beginning, which was to give face-to-face training through facilitators who had already been trained. This made us review the materials that had been prepared for the face-to-face classes for presenting online. (Neves, EdTech, 2021, interview). This sub-program was introduced at the university to provide UEM researchers and teaching staff with the Information and Communication Technologies (ICT), infrastructure, tools and pedagogical skills they need to be able to work effectively in line with current and emerging professional expectations ((Program UEM-SIDA, 2017)).

To understand how the EdTech sub-program intended to bring changes in the lecturers' pedagogical practices using educational technologies, even though similar projects implemented at UEM before the EdTech had resulted in limited uptake of educational technology by lecturers, this thesis is focused on the skills and pedagogical practices that lecturers have learned from this sub-program and the enablers and barriers faced by them in the process of introducing those technologies into their classroom practice.

Educational technology is, according to Januszewski and Molenda (2013) the process that provides better academic performance through the use of technological resources appropriate to the context.

The aim of this dissertation was to investigate to what extent the strategies presented by the EdTech sub-program contributed to the use of educational technology by the lecturers of the four investigated faculties at UEM**.** This purpose was explored by answering the following question: Does the new multifaceted, constructivist approach of the EdTech program enable lecturers to use educational technologies in teaching and learning at UEM?

This study was carried out in a period considered atypical due to the COVID-19 pandemic, which limited the search for some data that would have been obtained from observation.

1.2 Conceptual background

1.2.1. Rationale

Educational technology emerged as a process of planning, investing, implementing and evaluating the teaching environment and all learning resources, with the purpose of ensuring teaching and learning of better quality (Kurt, 2015). The purpose of those technologies is to simplify teaching and research.

In this perspective, lecturers at universities need to firstly understand the nature of their teaching challenges and which pedagogical strategies would be helpful to achieve learning outcomes. Once outcome and strategies have been aligned, lecturers can think about activities and the affordances of available technological tools including: Why should they be utilized, when should they be used, and how should they be integrated into the teaching/learning environment to achieve the ultimate aim of improving education. Lecturers also need to think about how these updated materials will change what they learn and how they educate. In this context, the present study aims to investigate how lecturers at UEM

have used educational technology to improve their classroom practices and which barriers they have faced in using these technologies.

1.2.2 Background of educational technology

“Over the past three decades there has been rapid growth in the use of computer and Internet technology for pedagogical purposes in higher education institutions around the world” (Buchanan, Sainter & Saunders, 2013:1). Rogers describes one of the most popular technology adoption models in his book, “Diffusion of Innovations” (Sherry & Gibson, 2002 cited in Sahin, 2006). According to the diffusion of innovation theory “effective technology integration is a function of the system, and can be influenced by changing the relative advantage, compatibility or complexity of the innovation” (Henderson, Henderson & Romeo, 2015:326).

The number of theoretical approaches have been developed to take into consideration the ways in which social systems influence the adoption or rejection of different innovations (Henderson et al. 2015) it because accordingly to (Franklin & Bolick, 2007) technology has been viewed as a keystone for improving student academic performance and increasing public school flexibility.

Different authors explain the emergence of educational technologies in different ways, based on specific periods.

Park, Lee and Cheong (2008) claim that distance learning and virtual platforms have become viable strategies in higher education. There are more and more lecturers and students who rely on the internet and the web to help the teaching and learning process. “A teacher's attitude toward technological conflict, and their understanding of the relationship between technology, society and the individual, will influence the way they teach technology” (William, 2012:6).

The new scenario of the integration of technologies in education requires the development of new skills, which has generated new challenges. This integration requires new roles from teachers and students that adapt to this new scenario. (Alonso, Plaza & Orfali, 2019)

Gregory, Scutter, Jacka, MacDonald, Farley and Newman (2015) defend the viewpoint that the principal issues that lecturers and students have faced using ICT in education are: technological issues (quality of internet); institutional issues (infrastructure, policies, lack of

alignment between technology, curriculum and strategy); personal perceptions (limited perceived effectiveness of technology, different social dynamic); and potential student difficulties (different social dynamic, cost, limited perceived effectiveness of technology).

Beliefs and motivations are also important factors in the use of technologies in education by teachers: “individuals’ beliefs about their competence or mastery in a particular domain affect their beliefs about whether their behavior will lead to a successful outcome”. “Those lecturers who have high levels of self-efficacy with respect to the technologies in question may be more likely to accept their use in practice” (Buchanan et al., 2013:2).

With the advancement of technologies, educational institutions have been awakening to the importance of using them in education. In Africa, there was an increased use of technologies; which was combined with changes made in higher education policy, assistance given to ICT users in universities and the improvement of the internet in terms of quality and cost (Osiakwan in Carr, 2013).

In Mozambique the barriers to making good use of technology are related to low bandwidth and the frequent breakdown of internet services. (Johnson, Jacovina, Russel & Soto, 2017).

1.2.3 The context of educational technologies in Mozambique

The government of Mozambique “approved a national ICT policy in 2000, and an action plan based around the design and implementation of strategic ICT projects in all sectors and institutions including the Education sector in 2002. The Strategy for Innovation in Science and Technology was approved in 2006” (Rowman, 2003) cited in (Muianga, Hansson, Mondlane, Nilsson, Mutimucuio & Guambe, 2013:107). The policy “provides guidelines and strategies for the education sector to encourage research, human resource development and knowledge transformation as a part of national poverty reduction efforts” (ibi:107)

Muianga (2011:109) argues that “successful implementation of ICTs must focus on infrastructure, attitudes, staff development, technical and administrative support, sustainability, and transferability”.

1.2.4 The context of this study

UEM is the oldest and largest public university in Mozambique. It is working towards the goal of becoming a research-led university and it also aims to produce its own content for the teaching and learning process. The integration of new information and communication technologies in the context of education has facilitated the emergence of new teaching and learning scenarios. As a public university “UEM has limitations on infrastructure and the technical capacity of lecturers, researchers and technical staff in the effective use of ICT within their jobs” (Muianga, 2011:109). “One in three to four experienced UEM lecturers have said that ICT in education is not part of their initial training” (Muianga & Mutimucuio, 2013:109), but they are using different technological means to interact with each other, and with students.

Recognizing the contribution of educational technologies within the framework of the UEM-SWEDEN cooperation, the SIDA-funded programme aims to build skills in the professional use of ICT, skills among UEM teaching staff and researchers and to use ICT in teaching and learning more effectively, because the key to success in bringing technology-based change to the academic environment is the capacity and motivation of staff to take the lead (RTPP-UEM-SIDA, 2017-2022; **s**ee also Appendix A7)**.**

To promote the use of Educational Technology, the EdTech Sub-Program emerged, which proposes an action plan that includes improving access to information and communication through upgraded UEM infrastructure, management and maintenance systems and large-

scale training in educational technologies for lecturers and postgraduate researchers, as well as professional training for computer technicians, in order to promote the process of teaching, research and learning in UEM based on the use of educational technologies. EdTech-UEM is a transversal program that focuses on four interconnected areas:

1. The establishment and consolidation of a new department at CIUEM-ICT for Teaching, Research and Development (ICT-EID), which will act in the field of educational technologies, among others;
2. Large-scale professional development activities for UEM researchers and teachers;
3. Rehabilitation and expansion of UEM's communication infrastructures; and
4. Postgraduate courses in educational technologies and technical areas relevant to UEM personnel, to be held at UCT.

The first step in the professional development component was the design and piloting of a series of four blended workshops as the core of the professional development of UEM lecturers to teach with technology.

These workshops were part of the EdTech-UEM sub-program, coordinated by CIUEM, with direct partnerships with the Faculty of Education at UEM and the Center for Innovation in Teaching and Learning (CILT) at the University of Cape Town (UCT). Four workshops were planned and implemented as a pilot in 2019 at UEM in the context of the possibilities of expanding blended learning. The workshops were designed to be delivered with the support of UEM's Moodle platform. The contents, activities, instructions, homework, bibliographic resources, manuals, videos, presentations, links to other tools, were all made available online, and use was made of several Moodle tools, such as Course Map, Forum, Blog and the template to collect participant ratings.

Each workshop was divided into two sessions, with a gap between sessions during which participants were expected to complete a homework assignment to consolidate the acquired knowledge.

The face-to-face sessions in workshops for university staff consisted of two to three half-day periods over three to five days, depending on the topic. Workshops also included online activities for completion by participants between face-to-face sessions. Training on campuses outside Maputo would be given in two workshops for different groups over the same number of days. Four faculties with varied experiences in the use of educational

technologies were chosen for the pilot phase, all from Maputo, for practical reasons: Education, Engineering, Science and Veterinary. The participants were selected by the faculties themselves, and a maximum of 15 participants per faculty were included. Scheduling was done in coordination with the host faculties or campuses, to facilitate maximum participation without affecting normal activities (EdTech-2020).

In 2019, all workshops – four sessions per faculty, totaling 16 sessions – were given during the four-week period, in the morning and afternoon in the event room of the UEM Innovation space on the Main Campus, and were facilitated by two members of the EdTech team at UCT, with support from UEM Informatics Centre (CIUEM) staff. Of the 65 enrolled, only 56 participated, of which 46 completed the pilot, which is equivalent to 75 percent participation. In terms of difficulties, for a significant number of participants, it was the first time making contact with Moodle, and they generally expressed confidence that, with more time, they would be able to master it. The difficulty in language was another constraint faced by both the participants and the trainers, as they were not always able to express the thoughts of the participants in translation.

Unfortunately, COVID- 19 changed the principle that had been established at the beginning, which was to give face-to-face training through facilitators who had already been trained. This made us review the materials that had been prepared for the face-to-face classes for presentation online. (EdTech 2, 2021).

Not long after the EdTech Sub-Program managed the workshops, the world was devastated by the Covid-19 pandemic, which forced countries to take a new stance in all sectors, including education. On March 22, 2020, the first case of COVID-19, the disease caused by the SARS-CoV-2 coronavirus was reported in Mozambique and one of the measures announced by President Filipe Nyusi through Presidential Decree No. 11/2020 of March 30 was to close all public and private schools and universities for 30 days. In this scenario face-to-face teaching was radically interrupted and lecturers were “forced” to switch to online teaching.

With the interruption of face-to-face classes by COVID, as a preventive measure. lecturers at UEM were forced to migrate from face-to-face classes to online classes.
This switch happened in the time that lecturers from some faculties at UEM had been trained in four pilot workshops promoted by the EdTech sub-program. It is in this context that the

present research arises, which aims to investigate the extent to which the workshops were an asset for lectures and for their pedagogical practices, especially in this time of pandemic.

The use of educational technologies has the potential to enrich the processes of teaching, research and learning at university level. The EdTech Sub-Program at UEM is “a program that aims to bring innovations to pedagogical approaches through the widespread use of educational technologies and ICT tools. This could potentially increase the flow of information and continuous integration of new methodologies aimed at the processes of research, teaching and learning” (UEM Informatics Centre , 2017:2).

However, the EdTech Sub-program is not the first project that has been introduced at UEM with the aim of encouraging the use of educational technologies by lecturers. Projects like TEDUCA, implemented by the Federal University of Pelotas and the UEM in 2014, and the “blended online and face-to-face learning” approach documented by Muianga (2005) attempted to encourage lecturers to use educational technologies at UEM. These projects resulted in only limited uptake of educational technologies. They will be discussed in more detail in the literature review. Bearing in mind lessons learnt from previous unsuccessful attempts at integrating educational technology at UEM, this research intends to study the new approach the EdTech UEM program brings in order to encourage/further enable lecturers to use educational technologies to improve the teaching and learning process.

1.3 Theoretical framework

The present study was guided by three theories. The first theory is constructivism, which formed part of the workshop design strategies chosen by the EdTech sub program to encourage lecturers to use educational technology. The second is adult learning theory, and the third is the community of practice theory.

Social constructivism, a learning theory, was used to understand the design and implementation of the workshops. Adult learning theory was used as a lens to understand the challenges faced by these lecturers in their contexts, and community of practice, in this study is used to try to explain the importance of working in a team to build new knowledge in educational technology.

The participants in this study come from four faculties. Lecturers range in their experience and expertise in educational technology from beginner to more confident users. Some lecturers work alone in their teaching while others work in groups as required in certain disciplines and subjects. Therefore, multiple theories were needed to understand the workshops themselves as well as the lecturers themselves and their contexts. Constructivist theory encourages teachers to create their learning

practices based on a real context. lecturers to design learning activities in an authentic context. Adult learning theory focuses on the characteristics of adult learners and how they bring in their experiences to guide them along the journey of learning and community of practice theory where participants share understandings concerning what they are doing and what that means in their lives and for their communities

1.4 Research objectives

The purpose of this research is to investigate to what extent the strategies presented by the EdTech sub-program contributed to the use of educational technology by the lecturers of the four investigated faculties at UEM.

The research was conducted across four faculties to allow the researcher to investigate the effect of the EdTech-subprogram and how this approach changed the way that the lecturers learn and teach in their contexts.

This research aims not only to surface the barriers faced by lecturers in the use of educational technologies, but also to show the advantages of using these technologies, especially at this time of pandemic**.**

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1.5 Research questions

The main question that guided this research was:

Does the new multifaceted, social constructivism approach of the EdTech program enable lecturers to use educational technologies in teaching and learning at UEM?

1.5.1 Sub-questions

I. What strategies does the EdTech Sub-Program use to encourage and support lecturers to make use of educational technologies?

II. What theoretical approach does the EdTech Sub-Program use to encourage and support lectures to make use of educational technologies?

III. What changes, if any, do lecturers make in their classroom practice after attending the workshops from the EdTech Sub-Program before and after the pandemic?

IV. What are the barriers faced by lecturers using educational technology?

V. What are the successful examples of the inclusion of educational technology in learning and teaching?

1.6 Methodology

A qualitative methodology was used in this study, because the researcher intended to investigate to what extent the lecturers from the EdTech sub-program have used the Educational Technologies learned from the series of workshops promoted by the EdTech sub program and how it has influenced the pedagogical practices of the target group. This qualitative research was framed by three theories: social constructivist theory was used to understand the design of the workshops and whether this design enabled the take up of educational technology in the classroom; adult learning theory helps to explain the barriers and the motives that lecturers present as adult learners; and communities of practice, which explain the contribution of experience exchange and the enablers to the use of educational technology.

1.6.1 Selection of participants

Fifteen lecturers from each of four faculties were selected to be part of the sample group of 46, who had completed the workshop's pilot. Potential participants were invited through phone calls to inform them about the research and ask for their collaboration in it. Lecturers, who had participated in all four workshops were contacted until fifteen had been recruited, which would be the sample. Everyone who was available to take part in the study scheduled the day and the way they would be interviewed according to their availability. Two members from the EdTech Sub-program were also interviewed.

1.6.2 Data collection and analysis

The data were collected using semi-structured interviews, which allowed the researcher to collect the participants' perceptions. The interviews were conducted online by Skype, Zoom or phone calls. UEM-SIDA programs were also used as data collection instruments.

The data were analyzed using coding. The codes for this study were not generated during the interviews, they were generated from the careful reading of the collected data and themes were formed based on the research questions that the study intended to answer. Once the data were coded according to these broad categories, the answers were grouped according

to similarities and similar comments. In this process, the percentage of lecturers who gave the same answer in some questions were determined to facilitate the presentation of findings.

1.7 Significance of the study

"UEM started a curricular reform programme around 2000" (Muianga et al, 2013:46). "and SCL were introduced to improve the quality of teaching and learning (Muianga, Klomsri, Tedre & Mutimucuio, 2018:46)". "It urged UEM to speed up the reform process in almost all faculties (Muianga, Klomsri, Tedre & Mutimucuio, 2018: 47)". In that context the EdTech sub-program proposed a series of training workshops in the use of educational technologies to improve teaching and learning. This study is important as it critically examines lessons learnt and how the EdTech approach is different, and responds to the needs of lecturers in relation to the use of educational technologies, and to what extent these actions can influence the learning and teaching process, especially in the Covid-19 context.

The study also aims to explore the views of the interviewees in relation to the effective use of educational technologies, focusing on the barriers and limitations, and how they have adapted their lessons since Covid-19 forced the closure of face-to-face classes.

The study is also important because it will contribute to providing information that will help the decision makers in the faculties and in the UEM itself, to know where to invest to increasingly improve the use of educational technologies at UEM.

1.8 Organization of this thesis

The second chapter includes a discussion of the international and local research literature which focuses on staff development in the effective use of educational technology, and barriers and enablers in the use of educational technology by lecturers in higher education institutions. This chapter is also focused on the important theoretical framework. Here the theoretical approaches, Constructivist Theory (Denzil & Lincoln, 1998; Kim, 2001; Deacon, Cox & Morrison, 2008; Ayaz & Sekerci, 2015), Adult Learning Theory (Williams, 2002;**)** and Communities of Practice (Williams, Slay & Sierborger, 2008; Cox, 2015; Polly, Martin & Guilbaud, 2020) that guide the study will be discussed to understand how they can contribute to the use of educational technology by UEM lecturers.

Chapter Three is about the research orientation, the approach taken to the research design, the methods of data collection, the participants chosen for the research and data analysis are described. There is also a discussion of ethical considerations and validity issues.

Chapter Four presents the empirical research findings of the study based on the main research question and the following sub-questions. What strategies and theoretical approach does the EdTech Sub-Program use to encourage and support lecturers to make use of educational technologies? What changes, if any, do lecturers make in their classroom practice after attending the workshops of the EdTech Sub-Program? What are the barriers faced by lecturers using educational technology? What are the successful examples of the inclusion of educational technology in the learning and teaching? What is the role of adult learning theory and communities of practice in explaining the uptake, or lack of uptake, of educational technology by lecturers after completing the EdTech program workshops?

In Chapter Five the relationship between the findings, the literature review and the theoretical framing is discussed.

The sixth and last chapter includes the conclusion and the recommendations for the use of educational technology at UEM.

CHAPTER 2: Literature review

2.1 Introduction

This chapter discusses the introduction of educational technologies (ET) through staff development in higher education institutions (HEIs). HEIs have developed various strategies and staff development initiatives in order to support lecturers in their attempts to integrate educational technology into their pedagogical practices. There are many barriers that lecturers face in using these technologies in the classroom, whether physical or virtual. Pertinent strategies and barriers will be outlined below in order to situate this study at UEM.

According to Oliver (2005), the teaching process is a personalized practice conducted according to the program and the objectives of the discipline. To ensure better results in the teaching and learning process (mainly in adult learners), some adult learning theories must be observed (Russel, 2006). The combination of the necessary learning strategies and the institution's interests is important to the teaching process (Hannon, 2008). Higher educations (HE) are always adapting and changing and "the constantly increasing integration of learning technologies in the curriculum in the 21st century, such as Web 2.0 software, through its applications, has contributed significantly to educational practices in various higher education institutions" (Almpanis, 2015:380). Oliver (2005:6) suggested that "the mainstream use of ICT in education will only ever occur when the vast majority of teachers are able to perceive that the technology will assist them and their learners." Taken together, these two views point to a deduction that the investment in "staff development activities … have become increasingly important" (Almpanis, 2015:380) in such contexts. Some of the arguments for staff development presented below focus on the introduction of educational technology and how to overcome barriers to staff in their use of educational technology, and explore the effects on the teaching and learning process.

2.2. Exploration of concepts

In this section, the main terms that guide this study are defined and discussed. Educational technology is a term that has been discussed in recent decades and is often associated with the quality of teaching, learning and research in the higher education institutions. To better understand the context of educational technology, a brief analogy of face-to-face learning, online teaching and blended teaching was made.

Traditional face-to-face learning, according to Bencheva (2010), is the process through which the learning takes place within the classroom and the teacher is the principal author of the process. “A blended learning classroom is one that integrates online modules of instruction and engages students through interactive videos and modules of instruction along with face-to- face (FTF) instruction” (Ward, 2020:2). Armando (2014) states that synthetically blended learning is “adding extra online activities to a traditional face-to-face course” (Alammaryr, Sheard & Carbone, 2014:440). Online teaching “is a process that takes place via the Web and may include text, graphics, animation, audio, video, discussion boards, e-mail, and testing” (Bencheva, 2010:63). These three concepts have the particularity of involving two main actors, the trainers and the trainees. Despite taking place at separate times, they involve the use of some technology for their realization. This technology is called “educational technologies”

2.2.1 Educational technologies

The study and practice of enhancing learning and improving performance through the creation, use, and management of appropriate technological processes and resources is known as educational technology. (Januszewski & Molenda, 2008). JanuszewskI and Molenda (2008:1) define educational technology as “the study and ethical practices of facilitating learning and improving performance by creating, using, and managing appropriate technological processes and resources”.

According to Kurt (2015:1) educational technologies include the following: “...conventional materials, such as the blackboard, overhead projectors, televisions, VCRs, slide projectors, and opaque projectors, as well as newer materials, such as the computer, various software applications, LCD projectors, camcorders, digital cameras, scanners,

the Internet, satellite, interactive TV, audio and video conferencing, artificial intelligence, and so on."

Educational technology was also presented by Raja and Nagasubramani (2018) as being the use of modern equipment and tools that promote better interactivity between those involved in the teaching and learning process.

All the concepts presented here converge in some aspects, that is, for the authors, educational technology involves process (which has to do with skills and the promotion of their use), equipment (the infrastructure and equipment suitable for the use of technologies), platforms (which are the tools available to assist the process), human resources (which are all the individuals involved in the process), and education (which is the field where they are employed).

The weak use of educational technology in higher education institutions is justified by some authors as a result of some factors that have had a negative influence. In the next section, the main barriers to the effective use of educational technology in the teaching and learning process are presented.

2.3 Barriers to educational technology use

Despite efforts of different HEIs to train staff in the use of educational technology, there are still barriers that need to be overcome for the successful implementation of educational technology in the classroom, whether it be online, blended or face-to-face. These barriers are present in HEIs across the globe. Some of the barriers in the Global North are not as acute as those faced in African HEIs.

2.3.1 Global North

The study carried out by Gregory, Scutter, Jacka, MacDonald, Farley and Newman (2015:6), with "responses received from 134 institutions in 28 countries, including 38 in Australia, 37 in the United States of America, 12 in the United Kingdom, 7 in Canada, 3 in New Zealand and Finland and the rest were made up of individual users from different countries, particularly in Europe and South America", concluded that the main barriers to the use of educational technologies at different levels are:

National

- Technological issues (T) (quality of internet)

Institutional

- Institutional issues (I) (infrastructure, policies, lack of alignment between technology, curriculum and strategy).

Staff development

- Personal perceptions (P) (limited perceived effectiveness of technology, Different social dynamic).

Student

- Potential student difficulties (S) (Different social dynamic, cost, limited perceived effectiveness of technology).

The results of a survey conducted at universities in the United Kingdom (UK) found that internet self-efficacy is one of the aspects pointed out by lecturers as a factor that limits the use of technologies in learning (Buchanan, Sainter & Saunders, 2013). The authors further suggest that individual (beliefs, values and experiences) and contextual factors (infrastructure, policies, motivations and resources) also influence the use of technologies by lecturers. Gilakjani (2013:264) states that “one of the other contextual factors that affect the use of computer technology is the inadequate computer technology support in hardware/software, the lack of effective training, lack of planning for computer technology integration, and lack of material support”.

In the United States (US), the barriers to technology adoption are listed as: “perception; resistance to change; technological support; financial support; infrastructure and knowledge/information” (Abrahams, 2010:44). Access to the necessary support and resources can stimulate interest in technology in lecturers (Johnson, Jacovina, Russel & Soto, 2017).

Lecturers need to be creative if they abandon traditional assessments and prepare assessments to be administered online. Assessment provides evidence that illustrates the extent to which the student has learned and is able to carry out activities (Chanpet, Chamsuwan & Murphy, 2018). Evidence in assessments using educational technology

should be based on a technology that allows for the collection of evidence of individual participation in conducting the assessments. (Zhai, 2019).

Johnson et al. (2017) found that lecturers are comfortable with their “lesson plans”, and they are not interested in introducing educational technology because its use would include a change in practice. Lecturers are motivated by seeing their students learning with the methodologies they use. This contributes to resistance to the use of technologies by teachers because they assume that they can achieve teaching goals through their already established teaching practices (ibid).

2.3.2 Barriers to ET use in African HEIs

African HEIs have implemented several educational technologies as a means of raising educational standards that they provide (Mtebe & Raisamo, 2014). However, according to Adam (2003: 200), the majority of HEIs in Africa “have neither well-established ICTs strategies or management information systems that provide consistent figures on their ICTs situation”. This situation contributes to challenges to the use of technologies in higher education institutions. The literature review identified the following barriers:

National

- Intermittent electricity (Sife, Lwoga & Sanga, 2007; Quinn, 2009; Mtebe & Raphael, 2017).
- Problems of internet access (Sife, Lwoga & Sanga, 2007; Quinn, 2009; Kandiero, 2015; Mtebe & Raphael, 2017).

Institutional

- Institutional ICT strategies (Adam, 2003; Sife, Lwoga & Sanga 2007; Cox, 2008; Quinn, 2009; Mtebe & Raphael, 2017).
- Lack of institutional support (Sife, Lwoga & Sanga, 2007; Kandiero, 2015).
- Limited financial resources within universities (Adam, 2003).

Staff development:

- Lack of continuous training (Sife, Lwoga & Sanga, 2007; Quinn, 2009; Kandiero 2015; Mtebe & Raphael, 2017).
- Lecturer’s skills (Adam, 2003; Cox, 2008; Hennessy, Harrison & Wamakote, 2010).

- ❖ Resistance to change (Sife, Lwoga & Sanga, 2007; Quinn, 2009; Mtebe & Raphael, 2017).

2.3.3 Barriers and/or challenges to the use of ET in Mozambique

Mozambique does not differ much from other African countries in terms of technology integration into the teaching and learning process. As it is a developing country, the challenges faced in the implementation of technologies vary from infrastructure to the skills of all actors involved in the process of teaching and learning.

According to Rambe and Mawere (2011:12), “the number of Mozambicans with access to computers was not impressive, suggesting that the bulk of the citizenry still was cut out of cyberspace”. This was “due to several compounding factors that include poverty, illiteracy and phobia for technologies, among others”. (ibid). Johnson et al. (2017) identified the following barriers to the use of technology in education in Mozambique: the irregular internet, poor infrastructure, and limited access to the internet due to the economic conditions of the country.

Nuvunga and Pempe (2017:14) maintain that barriers like the “electricity network; internet connectivity; training and human development, financing and policies” are pertinent and have negatively influenced the use of technologies in the teaching and learning process. It is not enough that HEIs have all the infrastructure and all the necessary technologies for education, lecturers must know how to use them, there must be a clear policy for the use of the technologies, the supply of electricity must be improved, and training must be continuous to reach even those lecturers who are still resistant. Recently, inadequate infrastructure and low maintenance capacity have been pointed out by Samussne, Silveira, Junior, Alexandre and Reis (2021) as some barriers that should be part of the universities’ action plan; in short, it can be said that, despite the improvement of the infrastructure and internet expansion, in Mozambique the barriers to effective use of technology in HEIs are related to low bandwidth, lack of lecturers’ training, inadequate infrastructure, lack of technical support and the frequent breakdown of internet services.

2.3.4 The impact of moving to online classes as a result of COVID-19 in Africa

The COVID-19 pandemic brought changes in all sectors around the world and the education sector was not left out. Social distancing, which is one of the prevention measures against COVID-19, forced educational institutions at all levels to interrupt/halt classroom teaching. “Many institutions have opted to cancel all face-to-face classes, including labs and other learning experiences, and have mandated that faculty move their courses online to help prevent the spread of the virus that causes COVID-19”. (Hodges, Moore, Lockee, Trust & Bond, 2020[1]).

As a way to guarantee the uninterrupted classes, educational institutions around the “world” migrated from face-to-face teaching to online teaching, although not all those involved in the teaching and learning process were prepared for this new teaching approach (Burgos, Tlili & Tabacco, 2021). This abruptness from face-to-face to online was named as being “emergency remote teaching” which is a temporary change, as an alternative in an emergency situation; changing teaching to a totally remote approach and being able to return to the initial model as soon as the crisis situation is resolved or normalized (Hodges, et al 2020).

“Universities in developing African countries are more vulnerable to the consequences of the COVID-19-pandemic thus, some initiatives have been launched in a few African countries to deal with the impact of COVID-19” (Muftahu, 2020:418). Sub-Saharan African universities were not prepared for online classes (Jacob, Abigeal & Lydia, 2020; Anifowoshe, Aborode, Ayodele, Iretiayo & David, 2020). In sub-Saharan Africa, many students, especially those with few resources, were unable to attend online classes (ibid). This sudden shift from face-to-face teaching to online teaching influenced students' attendance in classes, because neither the teachers nor students were prepared (Muftahu, 2020). Due this lack of preparation, “online teaching and learning became a massive challenge to deal with, and stakeholders are not potentially fit to adjust to the sudden educational changes, as they are not technologically competent to embrace the current situation” (Mishra, Gupta & Shree, 2020:2).

[1] https://er.educause.edu/articles/2020/3/the-difference-between-emergency-remote-teaching-and-online-learning.

2.3.5 The impact of moving to online classes as a result of COVID-19 in Mozambique

In a study of 6,542 students surveyed in a Mozambican university, 58.3% reported that they had difficulty “comprehending the content” as part of the move to online learning (Martins, Manjate, Tinga, Sitoe & Matusse, 2021). For these authors, difficulty in comprehending the contents could be explained by students’ lack of preparation for remote learning and the associated stress of the pandemic. This impact of COVID-19 may negatively influence the quality of education in Mozambique.

There are some positive factors that COVID-19 brought to education, such as the “exchange of experiences” in the use of technologies for education (Uacane & Pego, 2021:122). To respond to this new scenario experienced because of COVID-19, lecturers and students have shared experiences on the use of different existing platforms for teaching and learning and this contributes to the increasing diffusion of educational technology. Overall, the increased use of different technological tools and educational technology has also changed the approach of lecturers, making them more amenable to blended learning and its promises of enhanced interaction in various forms. As illustrated by Martins et al. (2021) and Uacane and Pego (2021), different tools have been used in Mozambican universities, such WhatsApp, Zoom, Google Classroom, YouTube, email, institutionally specific-platforms and Moodle. The use of these platforms has been according to the specifics of each course, the needs of the students and the abilities of the lecturers.

The literature review shows that although there is willingness on the part of teachers to adopt educational technology in their educational practices, but there are some factors that discourage them. Some common barriers, such as abilities and resistance to change in their practices, have been identified at higher education institutions, whether at a global, regional or national level, and there are also challenges at the individual level.

2.4 Enablers and successful examples of the inclusion of educational technology in the learning and teaching process

Despite the numerous challenges mentioned by the authors, the use of educational technology has brought several benefits to the teaching and learning process, and the

need for all stakeholders in the teaching process to be engaged in the effective use of these technologies is increasingly noticeable. According to Simmons and Markwell (2001:1) educational technology “promotes relevant learning experiences irrespective of geographic restrictions and improves student and teacher access to information and greater understanding of other cultures”. For Arkorful and Abaidoo (2015), using educational technology permits students to study whenever and wherever they like, encouraging them to communicate with one another and to exchange and respect other points of view.

Holmes and Gardner (2006: 30-31) summed up the following benefits of technology in education:

a) It is flexible in terms of time and place.
b) It allows access to a wealth of information.
c) It can facilitate relationships between learners through the use of discussion forums.
d) It is not necessary to have large buildings to have a maximum number of students
e) The use of educational technology allows “self-pacing”. For example, the asynchronous method allows each student to study at his or her own pace and pace, whether slow or fast.

“Approaches such as flipped classrooms and massive open online courses (MOOCs) will probably form part of the future of HEIs” (Strecker, Kundisch, Lehner & Schubert, 2018:186). These approaches have the potential to improve educational practices, and technical and pedagogical quality (Williams, 2010).

Recent research has shown that moving to online classes can require some creativity from the teacher in conducting their classes (Streker et al., 2018). Educational technologies have the potential to inspire creativity in lecturers, allowing greater interaction with students and ensuring constant evaluation, also providing lecturers access to vast resources (Strecker et al., 2018; Mahaye, 2020). Using educational technology, the teacher transitions from the transmitter to the mediator of learning, and the student becomes the main protagonist of their learning (Nuvunga & Pempe, 2017; Mayahe, 2020).

A study conducted in Australian higher education “has adopted a widening participation agenda with a focus on the participation of disadvantaged students”. The study “presents a range of resources and media, facilitating interactive and connected learning, enabling personalized learning and assuring high academic standards to contribute to student success using technology” (Devlin & Mackay, 2016:92).

At Monash University Malaysia, students need to acquire skills and knowledge in engineering and design because the content is complex and cannot all be covered in one class. As a result, different approaches were used to improve their assimilation (Lee & Yeap, 2005:4). “Electronic material was provided to the students in the form of handouts together with step-by-step solutions to problems along with clear explanations, when presenting a particularly complicated, complex, or lengthy subject. By handing out these notes, lecturers could have enough time to focus on the most critically important and conceptually difficult material. Shockwave and flash movies, Adobe Acrobat files, digitized photographs or video segments to explain a point more clearly were used” (ibid:5).

The use of educational technology in education is a challenge like any innovation, as it includes a shift in practice. However, the literature shows that it is possible to deal with the challenges identified as inhibiting the use of these technologies in education. The examples mentioned above show that, if there is engagement in the use of educational technologies, satisfactory results can be achieved in the education sector, and each teacher is responsible for seeking technological resources that enable the achievement of objectives in their discipline. To overcome barriers to educational technology use, some staff development initiatives have been implemented in universities.

2.5 Staff development and strategies to encourage lecturers in the use of educational technology

Promoting staff development (SD) is important in any sector, including the education area. The next section presents the different professional development (PD) approaches to promote the use of ET in HEIs at a global level, in Africa and in Mozambique.

2.5.1. Staff development in educational technology

Staff Development (SD) has been recognized by HEIs as a driving element in the use of educational technology. Proponents of e-learning warn that the massive use of ICTs in education depends on the training of all involved stakeholders (Mainka, 2007). This suggests that these educational institutions should train their employees to meet their needs in the use of technologies in a flexible way (Almpanis, 2015). Staff development is seen by Ullah, Khan, Murtaza and Ud Din (2011:20) as the "sum of activities that enhance the knowledge, skills, performance, vision and understanding of staff". SD helps in the development of skills that positively influence the teaching methods of teachers (ibid). Studies carried out in Pakistan on staff development concluded that "staff development is primarily concerned with the identification, formation and enhancement of skills" (Ullah et. al., 2011:23)

2.5.2 Global HEIs

Staff development in educational technology should be part of HEIs programs to ensure that staff are prepared to use technologies. Changes in any sector are always difficult and this challenges education managers (The Ministry of Education, University Managers, Educational Directors, Faculty Directors, among others) to design training strategies capable of encouraging the use of technologies by lecturers (Mostert & Quinn, 2009). According to MacDonald (2008) cited in Almpanis, (2015:24), "The effectiveness of a blended course will be greatly influenced by the skill, enthusiasm and availability of the staff who work on it". Without experience in educational technologies, universities need to invest in training their staff (ibid). In the United Kingdom (UK), for example, most universities provide a wide range of staff development sessions/events for their academic staff covering a variety of skills and pedagogical considerations of various learning technologies (Almpanis, 2015).

Improving the teaching and learning process by changing the lecturers' approach to the classroom or changing the way students learn is not just a task for educational technologies, these should only be an aid to the process (Salmon, 2005). The author explains that every successful educational technology implementation project requires ownership by the involved parties, training them, giving the necessary support and equipping universities not only with technological knowledge but also with pedagogical, learning design knowledge and adequate infrastructure.

The rapid development of technologies introduces the need to train lecturers who did not have any training in the use of technology in the teaching process. This requires universities to review their training plans to respond to the new dynamics brought about by the educational technologies. However, "combining new technologies with effective pedagogy has become a daunting task for both initial teacher training and in-service training institutions" (Jung, 2005:94). Lecturers with initial training based on face-to-face teaching are not always confident in the results that educational technology can bring and resist their adoption (Salmon, 2005). For this reason, Alammary, Sheard and Carbone (2014:440) stated: "Selecting the most appropriate design approach for a blended course is a major challenge for many teachers in higher education institutions who are new to the idea of blended learning". Blended learning courses are designed in various ways with the aim of responding to the needs of each course and/or subject (ibid).

The effective use of technologies in the teaching and learning process depends on how teachers perceive their usefulness, where and when they can be applied, but, mainly, on their continuous instruction in the application of these technologies (Jung, 2005). Recognizing the significance of ICT in teaching and learning, the majority of countries around the world have provided ICT teacher training in various forms and degrees. One of these forms presented by Jung is "Professional Development and Networking", "websites created to provide online resources that could help teachers develop their educational technology skills by connecting with diverse users and exchanging experiences". Professional development (PD) was also implemented in the UK at the "Virtual Teacher Center" (http://vtc.ngfl.gov.uk) – "the website includes a Career Development area which provides a variety of learning and teaching resources and links to support lecturers' continuing professional development". "In the center, lecturers can

find a range of resources for professional development, such as the ICT Support Network Directory which provides easy access to ICT provision and training, which is currently providing ICT training for lecturers and librarians" (Jung, 2005:98). Pedagogical training in the use of technology allows teachers to select learning activities aligned with learning theories and to ensure this alignment, follow-up activities must be included in training (Okojie, Olinzock & Boulder, 2006).

2.5.3 African HEIs

It has already been mentioned in the previous paragraphs that integrating technologies in teaching transcends the use of some software and hardware; there is a need for students and lecturers to be engaged in the process and for this to happen, they must be professionally prepared.

There is an increased use of technologies on the African continent. This is combined with changes made in higher education policy, assistance given to ICT users in universities, and the improvement of the internet in terms of quality and cost (Osiakwan in Carr, 2013). However, Lwoga and Sanga (2007:57) assert that "African universities which should be in the forefront of ensuring Africa's participation in the ICT revolution are unable and ill-prepared to play such a leadership role". As pointed out by Farrell in Lwoga and Sanga (2007:64) training through workshops, debates and collaboration are important to encourage the use of technologies by lecturers and raise the level of use of ICTs in teaching. The strategy proposed by Quinn (2009:72) for the challenges faced in the implementation of educational technologies in HEIs in Africa, focuses on "support and staff development issues". Carr (2013) cautions that SD does not mean that teachers will automatically change their pedagogical practices; change is a process that needs to be monitored and improved. This monitoring of training must also be done by educational managers who must find better ways to train their staff in the use of ET (Quinn,2009).

"The Teaching with Technology" project designed in 2003 at the University of Cape Town "included designing and researching staff development workshops using interactive computer-based material as a strategy for the integration of information and communication technologies into Humanities curricula" (Carr, Cox, Deacon & Morrison, 2008). Carr et al. (2008:110) proposed a "multidimensional model of staff development". This model "allowed for structure and flexibility, formality, experiential, procedural and

conceptual characteristics, quick and slow shifts in practices both closely facilitated and very autonomous change trajectories and was focused on staff development initiatives that encourage more creative and effective uses of teaching technologies".

African universities are not oblivious to the new scenario of integration of technologies in the teaching and learning process. In Ghana, at the "University of Education, Winneba (UEW) the Partnership for Higher Education in Africa (PHEA) Educational Technology Initiative (ETI) aimed to improve interactions between student and lecturer, between student and content, and the student's thoughts to develop and deploy hybrid courses on the Moodle" (Yidana, Edwards, Boison, Wilson & Sanfo, 2013:60). One of the "main activities within the PHEA involved the design, development and deployment of online courses. In order for the initiative to be sustainable, appropriate supporting technologies needed to be identified" (Mallison & Krull, 2013:33).

At UCT in South Africa, the "CoP-Based Staff Development Model" project was implemented to stimulate the use of educational technology by lecturers. The model was aimed at "exploring the possibilities of staff development workshops using interactive computer-based materials as strategy for the integration of information and communication technologies into Humanities curricula and pedagogy" (Carr et al., 2008:109). A series of workshops was developed as the initial component of the current multilayered model of staff development. This model allowed learning to be based on the experiences and motivations of the participants, respecting their time constraints, the level of commitment, and giving the lecturers autonomy to make changes in their way of learning and practice. It was designed with the aim of covering the learning activities of the lecturers and the exchange of experience between the participants, thus promoting collaboration between the lecturers who "teach with technology". (Carr et al., 2008:109-111).

In 2008, at the

> *"University of Jos (UNIJOS), the eLearning Fellowship Program with the aim of helping selected academics to serve as vanguards in the use of educational technology, stimulate interest, form a resource base, and train and support colleagues in their faculties and departments was introduced. In the first year of the eLearning Fellowship Program, seven academics were selected from five*

faculties: Arts, Law, Medical Sciences, Natural Sciences, and Pharmaceutical Sciences" (Adewumi, Dooga, Dakas, Yakmut & Mafwill, 2011:262-263).

> *"As a way of ensuring the success of the program, the selection of participants followed the following criteria: proficient background and skills in ICT; interest in using ICT for learning, teaching, and research; willingness to share experiences and skills with colleagues at faculty and department levels at the end of the training; willingness to sit for the International Microsoft Certification Examinations in Word, Excel, PowerPoint, and Internet" (ibid).*

2.5.4 Mozambican HEIs

According to the "Higher Education Strategic Plan of Mozambique (2012-2020), the major concerns of the government were expansion, quality improvement and increasing access to higher education" (MINED, 2012: 26-28). These goals are difficult to achieve with the current provision of ICTs in the Mozambican HEI sector. "Blended online and face-to-face learning were introduced to the Education Faculty at UEM in 2003, the objective being to explore the use of a course management system (CMS) within a flexible, student-centered teaching and learning strategy" (Muianga, 2005:130).

> *"The model chosen to deliver the CMS was TeleTOP, and two Masters-level courses were selected for the intervention. The implementation of TeleTOP required that the instructors redesign their courses in order to reduce the number of face-to-face lectures and to introduce more individual or group activities that required students' contributions within the course environment. This model resulted in improvements in flexibility in place and time; flexibility related to content; flexibility related to instructional approach; and flexibility related to delivery and logistics. The lecturers were cautious about changing their courses. Only one of the two instructors made extensive use of* TeleTOP". (Muianga, 2005:143).

The need for redesigning may be, from the researcher's point of view, the weakness of this model, as restructuring the course individually requires time and resources from the teacher, which may have contributed one of participants not adopting the model.

Another Professional Development Program was introduced by CAD (Academic Development Center) at UEM in 2013.

> *"This program was called the Staff Development Pilot Project (TPACK) and was composed of 14 modules and took a total of 480 hours. The modules were mandatory for all assistant teachers and a blended learning approach was used, combining e-Learning and traditional face-to-face teaching. The module included workshops about how to implement project-oriented learning, problem based learning, as well as how to incorporate ICT in the various lessons. In these modules, ICT was used as a tool to enhance teaching and learning". (Muianga, Barbutiu, Hansson & Mutimucuio, 2018:83).*

"Each module received two training courses per year on average, with a focus on how to use ICT as a tool to facilitate the modules. All assistant lecturers were required to attend, and a blended learning approach was used, combining e-Learning and traditional face-to-face teaching. " (ibid). The authors claim that this professional development project implemented by UEM has had a significant impact on beliefs and practices of the lecturers. Participants in the training were more likely to incorporate ICT into their pedagogical practices. The importance and impact of professional development in their day-to-day work were perceived differently by the 22 lecturers (Muianga, et al, 2018).

The "TPACK" (Technological Pedagogical Content Knowledge) is an approach that supports lecturers or educators to develop a series of modules for content areas (Hunter, 2015). TPACK recognizes that knowledge that needs to be developed by the lecturer in technologies can be considered "new" as it requires that new skills and practices be acquired to fit in with the lecturer's previous practices (Koehler & Mishra, 2008). The project "had a positive impact on the daily life of both teachers and students, and teachers recognized that ICT plays an important role in teaching their subject, and contributed so that EdTech had in its workshops teachers who already had some experience in the use of educational technology" (Muianga et, al, 2018:92-93).

2.5.5 EdTech Sub-Program

The focus of this research is the current EdTech sub-program. Recognizing the contribution of educational technologies within the framework of the UEM-SWEDEN cooperation, the Swedish International Development Cooperation Agency (SIDA) funded program aims to build capacity among UEM teaching staff and researchers in the use of ICT for teaching and learning. It is envisioned that the key to success in bringing technology-based change to the academic environment is the capacity and motivation of staff to take the lead (Program UEM-SIDA, 2017-2022). The EdTech Program includes improved access to information and communication through upgraded UEM infrastructure, management and maintenance systems and a large-scale training plan in educational technology for lecturers and researchers as well as professional training for computer technicians, in order to promote the blended learning at UEM.

To promote SD in educational technology, the EdTech Sub-program designed four blended workshops. The workshops were designed to be taught using the UEM Moodle platform. The workshops had a blended design with a combination of the face-to-face lesson and online interaction in order to model the practices that were being taught. The sessions were designed to maximize the affordances of both face-to-face and ICT-supported interaction, which were often simultaneous. The content, activities, homework, bibliographic resources, manuals, videos, presentations, and links to other tools were all made available online, and several Moodle tools were used, such as Course Map, Forum, Blog and the assessment. All participants who were registered for the workshops opened individual accounts on the platform.

Four faculties were chosen for the pilot phase, all from Maputo for practical reasons: Education, Engineering, Science and Veterinary. The participants were selected by the faculties themselves, and a maximum of 15 participants per faculty were included. The diagram below shows the EdTech Sub-program approach to promoting the use of ET at UEM.

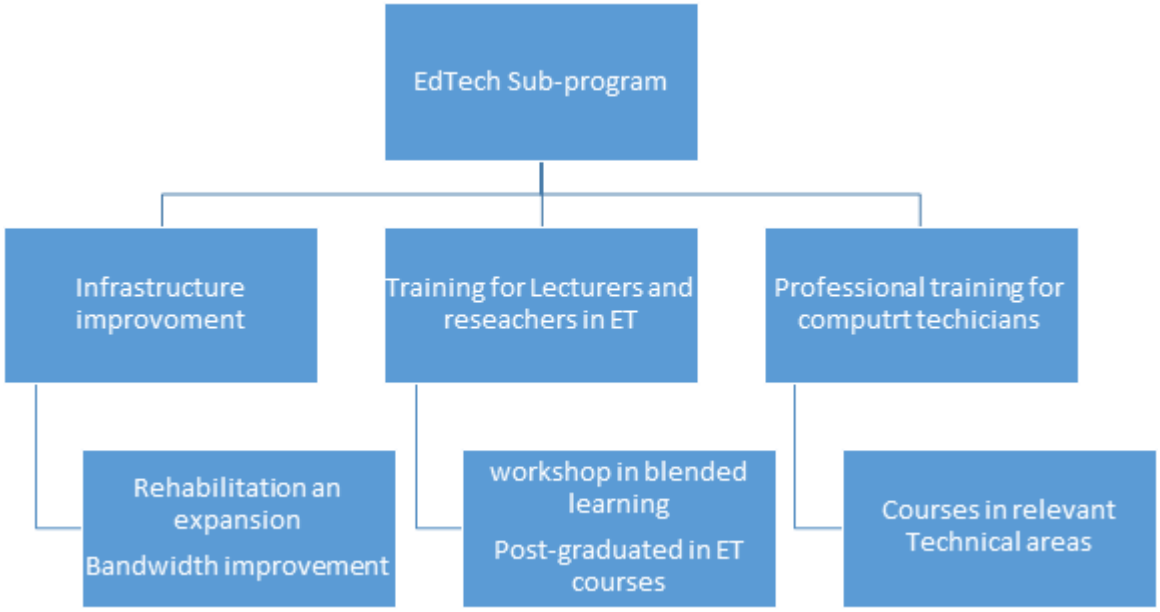

Figure 2.1: EdTech Sub-Program Approach

2.6 Theoretical and conceptual framework

The main research question of this thesis is concerned with the design and the effect of the EdTech sub-program for training lecturers in the use of technology for teaching, learning and research (EdTech-UEM, 2017). The focus is on the role of staff development and how it changes or does not change classroom practices. The theories highlighted here seek to explain the staff development intervention itself and the influence, or lack of influence, of this intervention on classroom practice.

2.6.1 Social constructivism and constructivism theories

Constructivism “is a theory about how we learn and the thinking process, rather than about how a student can memorize and recite a quantity of information” (Liu, 2010:65). Regardless of how the person is taught, constructivism argues that previous knowledge helps in the construction of new knowledge (Learning theories, 2020). Thus, even listening to a lecture involves active attempts to construct new knowledge; learning is the construction, creation, invention, and developing of one’s own knowledge and meaning (Liu, 2010). The constructivist approach to staff development promotes higher level thinking skills, “encouraging lecturers to design learning activities in an authentic context, so that learners will be engaged with the lessons” (Allsop, 2016:3).

“Social constructivism is a theory of knowledge in sociology and communication theory that examines the knowledge and understandings of the world that are developed jointly by individuals” (Amineh & Asl, 2015:13). Kim (2006) states that, in this theory, understanding happens when there is coordination between individuals. Social constructivism consists of valuing reality and knowledge and learning from learning. Kim (2006) also claims that social constructivism is guided by the following premises illustrated in the diagram below.

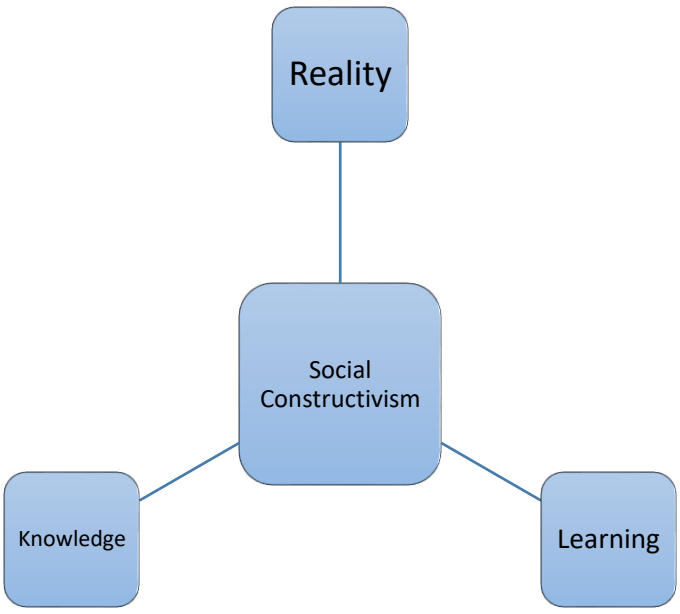

Figure 2.2: Social Constructivism Theory (Kim, 2006)

“Social constructivists believe that ‘reality’ is constructed through human activity; that ‘knowledge’ is also a human product, and is socially and culturally constructed. Social constructivists view ‘learning’ as a social process” (Kim, 2006:3). As the diagram above illustrates, social constructivism plays an important role in the construction of new knowledge. In the context of this study, social constructivism encompasses classroom practices, professional course work that lecturers have engaged in at courses, schooling and the social context in which this learning takes place. These aspects presuppose that the construction of knowledge must take into account the experience of the learners. In this thesis, the learners are a group of adults with different characteristics, and therefore adult learning theory will also be included here to attempt to understand how adults learn. Social constructivism theory was used in 2005 in the “Blended online and face-to-face learning (CMS) project in the Education Faculty at UEM with the objective of exploring the use of a course management system (CMS) within a flexible, student-centred teaching and learning strategy” (Muianga, 2005:130).

Nineteen years later, with the emergence of the EdTech Sub-program, Social Constructivism is being used again at UEM during the four pilot blended workshops introduced to lecturers from four faculties to encourage the use of educational technology. Carr, Deacon, Cox & Morrison (2008:104), mention the importance of social constructivism when they discuss staff development in educational technologies “explaining the application of the knowledge to local context”, as a component of emerging teaching with technology staff development model. “The only effective way to deal with the difficulties in the use of technologies is “to adopt a strategy that attempts to show that technology, as well as a science, can be understood as a social construct” (Bijker, Hughes & Pinch, 2012:19)

2.6.2 Adult learning theory

Adult learning theory was also explored to fully appreciate the challenges faced by lecturers in changing the way they teach to include the use of educational technologies. Dewey (1894 cited in Williams, 2009:2) argues that “the central concept of adult learning comes from experience”. Experience provides a foundation for problem solving, and problem solving leads to growth and change (ibid).

This is a theory that better responds to the learning needs of adults that differ from the learning needs of children who do not bring any experience into the process, and different from the Skinner theory, for example, that propounds that learning is the result of stimuli-response and children can learn by responding to these stimuli (Prass, 2012).
Adults are motivated by the idea that new learning will bring changes in order to improve their skills, behaviour, knowledge levels and, in some cases, their attitudes (Russel, 2006).

> According to Cox (2015), andragogy allows adult learners to build knowledge based on their experiences. “Adults have an abundance of prior life and work experience, which act as a catalyst to inspire or to hinder learning” (ibid.:29).
>
> *“Andragogy makes five assumptions about adult learners: a) Adults are independent and self-directing; b) They have accumulated a great deal of experience, which is a rich resource for learning; c) They value learning that integrates with the demands of their everyday life; d) They are more interested in immediate, problem-centered approaches than in subject-centered ones; and e) They are more motivated to learn by internal drives rather than by external ones” (Kaufman, 2003:213).*

“Experiential learning theory defines learning as the process whereby knowledge is created through the transformation of experience” (Kolb, Boyatzis & Mainemelis, 2014:228). According to experiential adult learning theory, the essence of adult learning is making sense of experiences (ibid). “Effective learning is seen when a person progresses through a cycle of four stages of (1) having a concrete experience followed by (2) observation of and reflection on that experience which leads to (3) the formation of abstract concepts (analysis) and generalizations (conclusions) which are then (4) used to test hypotheses in future situations, resulting in new experiences” (McLeod, 2017:1-3).

Reflective learning theory consists of creating critical thinking about the environment or a situation around them in students, teachers and any actor in the education sector (Parker, Racz & Palmer, 2020). Adults learn best when creative ways of learning such as learning by doing are incorporated into the process (Merriam, 2018). A study conducted by Conger (1993) showed that workshops based on adult learning theory can contribute to staff

development. In this study, the author concluded that the workshops and seminars he analyzed included four distinct elements: personal growth, conceptual overview, feedback; and skill-building. For Merriam and Caffarella (1999) "...the context of adult life and the social context shape what an adult needs and wants to learn and, to a somewhat lesser extent, when and where learning takes place".

Twenty years later, Chen, Chia and Fang Bi (2020) maintained that, to train adults, the program developers need to know how blended learning (for example) is conducted and whether it is linked with better learner experience and learning outcomes They argue that, to train adults, there needs to be a link between technology, learner's experience and a targeted learning outcome.

This theory is important to this research because the target of this research was a group of adult lecturers that attended the four workshops delivered by the EdTech sub-program who have their own experience, characteristics and beliefs. Thus, in this research, the principles of social constructivist theory are combined with an understanding of adult learning theory to explain how participants in the workshop have learnt about educational technology and then proceeded to use/or not to use educational technology in their classrooms. In addition to these two theories, a third theory emerged in recognition that the exchange of experiences built from constructivism and the knowledge that they have been building throughout their lives as adults can be important to build a community of practice in educational technology at UEM.

2.6.3 Community of practice theory

According to Lave and Wenger (1991:98) "a community of practice is a participation in an activity system where participants share understandings concerning what they are doing and what that means in their lives and for their communities". The premises of social constructivism are reality, knowledge and learning as stated (Kim, 2006). In turn, the community of practice is formed within a reality, where an exchange of knowledge and learning is built together. The existence of knowledge is inextricably linked to the existence of communities of practice, not least because it provides the interpretive support required to make sense of reality (ibid). Community and practice are sources of the concept's reusability, allowing it to be appropriated for a variety of academic and practical purposes (Cox, 2015).

“Community practices may facilitate the potential of working in collaborative groups through the exploration of the affordances that ICTs offer in supporting learning within the university and in cooperation with the community” (Williams, Slay & Sierborger, 2008:442). “Peer support coaching by a peer mentor in a collaborative relationship with the faculty is important to build a community of practice" (Polly, Martin & Guilbaud, 2020:139). In the TELfest project, for example, “networking opportunities were integrated within the agenda and a number of workshops to encourage group activities to further develop ideas and understanding of concepts collaboratively, in this way promoting the community of practice” (Latif, 2017:9). In this project the community of practice has influenced changes to practice. The community of practice theory is a form of social construction that allows knowledge to be built respecting the social context of learners.

2.6.4 Integration of the three theories

The diagram below summarizes the theoretical design of this study focusing on the EdTech Sub-program strategy, barriers to, and enablers of using ET at UEM, and built on the three theories elucidated above.

The following diagram illustrates that the theories can be combined in the design of a staff development strategy for the use of technologies in the teaching and learning process. The focus of this study was the strategies adopted by the EdTech sub-program, and the barriers and the enablers in the use of educational technology by the lecturers from UEM. EdTech's strategies are based on social constructivism, which is how learners make meaning through individual and shared reflection on their experiences. Some of the barriers found during the interviews as being the reason that some lecturers have not used educational technology, are justified by the adult learning theory when it states that the centre of adult parenting is the experience that this adult has on a particular subject, as the adult builds new knowledge based on their previous experience. However, there are lecturers who have used IT effectively and have shared their experience in their community of learning, where knowledge is shared and experience is exchanged, and there is a great possibility of building knowledge.

Figure 2.3: Diagram of Educational technology at UEM

2.6.5 Summary

The literature review shows that educational technologies are much more than technological devices used in the teaching and learning process. Educational technologies involve a whole set of tools, processes, human resources and skills for their effective use in education. They have the potential to improve teacher-student interaction by creating more motivating learning environments for both.

There is a need for educational institutions to invest in infrastructure that enhances the use of educational technology. This investment can enable the use of technologies in the teaching and learning process and bring with it numerous advantages, such as: enhancing feedback to students and staff, saving time, reducing administrative loads and improving the balance of assessment methods. The use of educational technology motivates students to interact with one another, exchange and respect different points of view, and may also enhance the efficacy of knowledge through accessing a huge amount of information.

In different higher education institutions, initiatives have been carried out to encourage the use of technologies. Strategies adopted by institutions are aimed at training lecturers

in the use of technologies. It seems that, even with lecturers being trained in the use of technologies, there is still a certain resistance to the effective use of these technologies.

A reluctance to use educational technology is a result of various barriers, such as inadequate infrastructure, poor internet quality, lack of necessary devices to conduct learning using technology, lack of both teacher and student training, and lack of transparency in assessments. Staff development workshops at EUM used a constructivist approach in order to engage all lecturers, which can be considered as a limitation for some lecturers without experience. The theory of community of practice plays an important role in the mass use or non-use of educational technology by lecturers, as, in some cases, the lack of use of these technologies is justified by the lack of collaboration of some lecturers who have no interest or domain in the use of educational technology. On the other hand, there are lecturers who are encouraged by colleagues who have expertise, through the exchange of experiences about educational technology in their teaching practices.

The effective use of technologies in the teaching and learning process depends on how lecturers perceive their usefulness. Other factor such as “moral, psychological and cognitive development” have a significant influence in adoption of technology by lectures (Webb, 1996: need page number). Staff development has been considered fundamental to the use of educational technologies by HEIs in different countries and to enable lecturers to understand the advantages of their use in classroom practices, considering the aforementioned aspects. Various authors have mentioned several barriers that contribute to the poor uptake of educational technologies in the teaching and learning process and suggest, that staff development in educational technology could be complex because the use of technologies in education is not linear, and those who are involved in the process have different skills and motivations (Hunter, 2015:42).

In Mozambique, for example, it is not enough just to invest in staff development because there are still some Mozambican universities that do not have adequate infrastructure; these universities have a need for infrastructure and prepared staff (Muianga et al., 2018).

With the outbreak of the COVID 19 pandemic, universities resorted to emergency remote teaching, which is a strategy adopted to respond to temporary crisis situations. However, not all universities were prepared for this sudden change from face-to-face teaching to

remote teaching and this negatively influenced the teaching and learning process. During the time of the COVID-19 pandemic, the use of educational technology became essential to ensure the continuity of teaching and learning process in a safe way. Platforms such as Zoom, WhatsApp, Facebook, Google Classroom, Moodle and YouTube have been used extensively and continue to be used.

The use of these platforms to guarantee the continuity of teaching and learning had implications not only for the quality of teaching but also for students' adherence to it. At universities, which belong to less-developed countries, such as UEM, students have not had the resources to access remote classes and lecturers showed that there was a need to invest more in staff development to respond to crisis situations like this.

CHAPTER 3: Methodology of the study

3.1 Introduction

This chapter presents an overview of the methodology used to conduct the study. It includes the research orientation, type of research, and the research approach. In this chapter, the choice of certain methods is explained and justified. This chapter also includes research questions, the selection of participants, a description of what was done and how the data were analyzed. as well as the research procedures, issues of validity, and ethical considerations (Maxwell, 2008).

3.2 Research orientation

The research orientation of this study is interpretive. The interpretive research paradigm is related to the need to understand the world from a subjective point of view, seeking explanation within the participant's frame of reference rather than the objective observer of the action (Ponelis, 2015). From the perspective of interpretivism, the researcher sought to obtain rather than attempting to generalize the basis of understanding to the entire population, a deeper understanding of the phenomenon and its complexity in its unique context is required (Wahyuni, 2012; Ryan, 2018; Pham, 2018).

This study was carried out in four faculties in order to understand the factors that contribute to the use or non-use of educational technologies in the teaching and learning process, taking into account the context of each respondent, which is why interpretivism was the chosen approach. Wahyuni (2012) argues that researchers who employ interpretivism as a paradigm believe that Individuals have unique origins, assumptions, and experiences that contribute to the ongoing construction of existing reality in its broader social context via social interaction.

Despite the interviewees having participated in the same training, the use of educational technologies in their practices as teachers depends on their experience, beliefs, the context in which they are inserted, and it is important to interpret the answers given by them considering all the factors mentioned above. According to Ryan (2018:8), “Interpretivism has a ‘relativist’ ontological perspective. Relativists suggest that reality is only knowable through socially constructed meanings and that there is no single shared reality.” This realism is built by social actors and people’s perceptions about it (Wahyuni, 2012). Interpretivism focuses on factors related to a specific context, differentiating humans from physical factors. (Alhrahshen & Pius, 2020). Therefore, the interpretivist paradigm allows the researcher to

treat the research context and considering the associated circumstances as well as the specificities of the participants involved, its situation is unique.

3.3 Type of research

A qualitative methodology was used in this study. In a qualitative study, the questions are broad and general and focus on collecting detailed information from the participants (Creswell & Clark, 2004). The choice of the qualitative method is related to the fact that the researcher wanted to understand the influence of the four pilot workshops offered by EdTech Sub-program on the pedagogical practices of the target audience.

As Maxwell (2008) says, a qualitative study allows the researcher to sensitively analyze changes in a particular group or event (ibid). This qualitative methodology enables the researcher to investigate how lecturers have used technologies in their learning and teaching process. In the time we live (COVID-19 pandemic), using educational technology is important to ensure the continuity of the teaching and learning process, and how lecturers have used these technologies is important to ensure the quality of teaching. Qualitative research enables the study of phenomena in their natural environment, interpreting them according to reality (Kohlbacher, 2006).

This qualitative research study allowed the researcher to analyze and code the data, interpret the information provided by the participants in order to write a comprehensive account of the experience lecturers had during these workshops. According to Creswell and Clark (2004:6), “in qualitative research the researcher analyzes and codes the data for description and themes, interprets the meaning of information drawing on personal reflections and past research and writes the final report that includes personal biases and a flexible structure”. The qualitative study was chosen to answer the following four research questions. What strategies and theoretical approach does the EdTech Sub-program use to encourage and support lecturers to make use of educational technologies? What changes, if any, do lecturers make in their classroom practice after attending the workshops of the EdTech Sub-program before and after the pandemic? What are the barriers faced by lecturers using educational technology? What are the successful examples of the inclusion of educational technology in learning and teaching? What is the role of adult learning theory and communities of practice in explaining the uptake, or lack of uptake, of educational technology by lecturers after completing the EdTech program workshops? These are summarized as:

strategies for using educational technology, changes made by teachers in the classroom using educational technology, barriers to using educational technology, and examples of successful use of educational technology.

3.3 Research approach

As emphasized by Noor (2008), choosing the method to be applied during a research study depends on the nature of the problem you intend to investigate. In this study, a case study approach was applied with the unit of analysis being represented by a group of lecturers from the workshop pilot. The case study, according to (Yin, 2002 cited in Yazan, 2015:138), is “a contemporary phenomenon within its real-life context, especially when the boundaries between phenomenon and context are not clear and the researcher has little control over the phenomenon and context”.

A case study approach is used in this study to allow the researcher to capture and to analyze the use of educational technologies in four faculties at UEM; two of them inside the main campus and two outside. The choice of the case study as an approach is not related to wanting to investigate technologies in general, or only educational technologies, but also to investigate the pedagogical practices of this specific group of lecturers who were trained in educational technologies. Stake (1995:3) argues for the importance of a case study approach, “The case is given, we are interested in it, not because by studying it we learn about other cases or about some general problem, but because we need to learn about that particular case.”

Case studies allow you to collect data on a particular subject from the participant's point of view (Tellis, 1997). The case study category for the present study was the exploratory case study. According to Zainal (2007), the exploratory case study allows the researcher to explore a phenomenon that provides data that are of interest.

The case study uses many sources that are deemed necessary for the study, such as: “Documentation; Archival Records; Interviews; Direct Observation; Participant Observation and Physical Artifact” (Yin, 1994:80). Interviews were used for the current study. The Interviews (the source used for this study) allow the researcher to focus only on the group selected as a sample and on a specific topic, in this case, perception of barriers, changes and enablers; nonetheless, this source can lead the respondents to express what interviewer wants to hear (Tellis, 1997).

3.4 Sampling of participants

Two EdTech sub-program members and 15 faculty workshop participants were interviewed. According to Hammersley (2013:13), “qualitative inquiry often involves investigation of a small number of naturally occurring cases”. These participants were chosen using a convenience sampling method. According to Marshall (1996), convenience sampling involves the selection of the most accessible subjects. This resulted in 60 possible participants.

The next step was to select participants, who had attended all four workshops, through a purposive or judgment sampling technique (Marshall, 1996). This technique is used to select the most productive sample to answer the research question. For the current research, lecturers who had attended all four workshops were called by phone to explain the nature of research and asked to participate in the research. Invitations were sent to 10 lecturers by email at each faculty, but only two or three confirmed the invitation by email.

The semi-structured interviews were conducted (Appendix A2) with two staff developers of the EdTech sub-program as key stakeholders and 15 lecturers from four faculties, three from Veterinary, three from Engineering, four from Science and five from Education. The table below shows the characteristics of participants in terms of age, work experience, gender and degree.

Table 3.1. Demographics of the participants

Faculty	Number of lecturers interviewed	Gender	Age	Years of work experience	Degree
Veterinary	3	One man and two women	35 - 50	10 - 20	Two Master's and one Doctorate
Sciences	4	Two men and two women	35-45	3 - 15	Three Master's and one undergraduate degree
Education	5	Two women and three men	35 - 50	4 - 11	Three Master's and two undergraduate degrees
Engineering	3	All men	35 - 60	6 - 29	One Doctorate, one Master's and one undergraduate degree.

3.5 Method of data collection

The first idea when designing the research was to conduct it through two data collection methods. The first would be semi-structured interviews and the second would be observation. The interviews aimed to collect the perspectives of lecturers in relation to the use of educational technology, especially after they attended the EdTech workshops, in turn, the observation would focus on observing the practices of the same lecturers in the classroom in relation to the same technologies and making a correlation with the data collected from the interview. However, due to the COVID pandemic it was not possible to use observation as an instrument of data collection because the majority of lecturers were working from home.

In this context, data collection was only in the form of semi-structured interviews with academics and EdTech staff developers. According to Adams (2005:493), in the semi-structured interview, "the dialogue can meander around the topics on the agenda rather than adhering slavishly to verbatim questions as in a standardized survey and may delve into totally unforeseen issues". It allows the respondent to express any word or phrases that he/she deems relevant but that are not part of the initial question.

Interviews were "used to collect in-depth responses about people's experiences, perceptions, opinions, feelings, and knowledge" (Dabic & Stojonov, 2014:363**).** The interviews were administered online and by telephone to reduce the possibility of exposure of the interviewer as well as the interviewees to Covid-19. The interviews were conducted and recorded in one of three ways (Zoom, Skype and phone calls).

3.5.1 Supplementary documents

To complement the data collected in the interviews, documents, like Mozambican policy on information and communication technologies, the UEM policy for the use of educational technologies, the brochure of the UEM-SUECIA program, EdTech Program: workshops-pilot-Report and Evaluation, Med ICT academic writing, UCT Author-Date Reference Guide, UCT Ethical Clearance and websites were consulted.

Table 3.2: General matrix of research questions, method and supplementary document

Research questions	Interview	Supplementary document
What strategies does the EdTech Sub-program adopt to encourage and support lectures to make use of educational technologies?	2 interviews with (2 EdTech Staff Developers) April, 2021	Brochure of the UEM-SWEDEN program
What changes, if any, do lecturers make in their classroom practice after attending the workshops from the EdTech Sub-program?	15 lecturers interviewed April to June 2021	
What are the barriers faced by lecturers using educational technology?	15 lecturers interviewed April to June 2021	UEM policy for the use of educational technologies
What are the successful examples of the inclusion of educational technology in the learning and teaching process?	15 lecturers interviewed April to June 2021	

3.6 Data analysis

"A basic principle of qualitative research is that data analysis should be conducted simultaneously with data collection" (Maxwell, 2008:236). This allows you to gradually narrow the scope of your interviews and decide how to test your emerging conclusions. (ibid). For the present study, data analysis was not carried out simultaneously with data collection because the interviews were conducted online with limited time, and as a way of managing time all interviews were recorded and analyzed later.

The data were analyzed using coding. “Code”, according to Saldana (2013:3), “is a word or short phrase that symbolically assigns a summative, salient, essence-capturing, and/or evocative attribute for a portion of language-based or visual data”. “Coding”, for Maxwell (2012:237), allows for the fracturing of data, which enables the “researcher to rearrange the data into categories that facilitate comparison between things in the same category and between categories”.

Data analysis, according to Elo and Kyngas (2007), can be used inductively or deductively with either qualitative or quantitative data. Inductive analysis was chosen to analyze the data, because, according to Braun and Clark (2013), inductive coding is an strategy that allow the generation of codes from the collected data. In this approach, there is no notion of what the codes will be; they are being generated from the available data. The codes for this study were not generated during the interviews, they were generated from the careful reading of the collected data, and themes were formed based on the research questions that the study intended to answer. Deductive coding was not used in this study because the researcher had no information about the respondent and about the theme of research, while the deductive method assumes that the researcher has created a codebook to help guide him/her through the coding process (Christians & Carey, 1989).

3.6.1 Steps of data analysis

Firstly, data from the interviews were recorded and then transcribed into a text document. While transcribing, some important aspects were taken as notes that could later be used as codes. All interview transcriptions were uploaded to Excel, (appendix A3) a sheet was set up per respondent and each utterance was given a row. This tool can also “sort the data based on the color of the cell (or even font color if necessary)” (Bree & Gallagher, 2016:2816). Excel, in addition to allowing the documenting of data, is accessible to any researcher because it does not need expensive programs or software (Ose, 2016).

The next step was to highlight in red the words that reflected the answer to the question asked and in blue the relevant words or phrases that were unexpected thus forming the codes.

As Saldana (2013:8) claims, “coding is a method that enables researchers to organize and group similarly coded data into categories or families because they share the same characteristic”. The data were coded in the following broad categories: barriers, enablers, advantages, platforms and support. Within these categories unexpected responses were also noted.

Once the data were coded according to these broad categories, the answers were grouped according to similarities and similar comments. In this process, the percentage of lecturers who gave the same answer in some questions was determined to facilitate the presentation of findings.

3.7 Validity and reliability

One pilot interview was completed before administering the interviews (Appendix A1) which helped in the reformulation of the questions to ensure data reliability. “Validity refers to the extent to which a concept is accurately measured and reliability refers to the consistency of a measure” (Heale & Twycross, 2015:66). During the piloting of the interview, the researcher noticed that there was a need to improve some issues to facilitate the interaction with the interviewees, as well as extend the time of the 20-to-30-minute interview due to the means used to conduct the interviews. As the interviews were online, they were susceptible to internet fluctuations, and there was a need to formulate clear questions to facilitate the interviewees' perceptions.

All the interview questions are related to the same workshop series that the researcher and the respondents participated in, which may influence the answers given by respondents by limiting them to answering only what is convenient, and perhaps also hiding important information (Maxwell, 2012), but could also make it easier for the researcher to identify inconsistencies and gaps. To overcome this problem, Maxwell (2008) proposes searching for discrepant evidence and negative cases; that is, instances that cannot be explained by a single interpretation. The basic principle of this issue is that you must rigorously examine both supporting and discrepant data to determine whether it is more plausible to retain or modify the conclusion, while keeping in mind all of the pressures to ignore data that does not fit your conclusions or explanation, which can highlight significant flaws in the data (ibid). To validate this study, the interview questions were designed based on the research objectives that were previously elaborated based on the four EdTech workshops. According to Morse, Barrett,

Mayan, Olson and Spiers (2002), this type of validity is called face validity because it allows the instrument to be validated by relating the questions and objectives of the study.

The pilot interview was carried out with an expert in ICT in education from Universidade Eduardo Mondlane in order to evaluate the proposed instrument for data collection, and a lecturer from the Faculty of Education, who was not part of the sample. All participants received transcribed interviews to confirm their responses (member checks) (Heale & Twycross, 2015; Muianga et al., 2018).

3.8 Ethics

Ethical clearance for this study was obtained from the Faculty of Humanities at UCT (Appendix A6) and the permission to conduct the study was sought with relevant Faculty Directors at UEM. This included obtaining the consent of all participants who were part of the sample in this study, by providing all information related to the research objectives. Despite being from different faculties, the participants in this sample belong to the same university as the researcher and took part in different stages of the same series of educational technology workshops. This may suggest that there may be manipulation of the data. This position is defended by Williams (2009) when he addresses aporia. Aporia, according to this author, is related to practitioners' reflections on ethical concerns they may experience during their research, they used academic colleagues as subjects.

Williams (2009:215-217) proposes that five aporias emerge when we analyze respondents' interview transcripts, and some of them could be used in this research: the "aporia of the agency of subjects; the aporia of identity and representation: the aporia of the confessional space; and the aporia of multiple practitioner roles". The present study focused on only aporia of multiple practitioner roles because, according to Costley and Gibbs (2006:89), this aporia is focused on the peculiarity of "research involving friends, work colleagues and other professionals", however, this peculiarity didn't have any influence on the research data because, despite being colleagues, the majority of the respondents were unknown to the researcher.

Another aspect that Williams mentions in research involving human beings is guilty knowledge. The guilty knowledge, according to the author, has to do with "wider reference to any knowledge about a person that has the potential for harm" (Williams, 2009:214). As a way of safeguarding the identity of the participants, even those who carry a "guilty

knowledge", pseudonyms such as "Lecturer 1 edu", "lecturer 2 vet", etc. were used. Even participants who work directly with the researcher received the same respect and confidentiality.

Participants signed the consent forms before taking part in the interviews (see Appendix A4 and A5). They received a formal request that allowed them to sign, consenting to participate in the interviews. The formal request was accompanied by the research objectives so that the participants had all relevant data and were aware of the nature of the interviews.

3.9 Summary of chapter

This chapter presented in detail the approach used for the present study. The research orientation, the type of research, the research approach, the participants and their characteristics relevant to the research were discussed. The data collection instrument for this study was tested before data collection, which allowed the researcher to improve the questions based on the feedback received from the pilot. The techniques and steps used for the presentation and analysis of data were presented in detail in order to ensure that all data relevant to the research were presented for further discussion. The chapter culminates with the validity and ethical considerations that guided the research from the selection of participants to the administration of the interviews.

CHAPTER 4: Findings

4.1 Introduction

This chapter presents the results of research on Educational Technology (ET) staff development workshops and the subsequent use or lack of use of educational technologies by workshop participants in their teaching. Firstly, the profile of respondents is described including their experience in the use of educational technologies. Secondly, the findings from interview analysis are presented under the following headings: the strategies of the EdTech sub-program staff developers; changes that lecturers have made in their classroom practice in the context of the COVID-19 pandemic; challenges or constraints faced by lecturers using educational technology; and successful examples of the inclusion of educational technology.

4.1 Participant profiles

4.1.1 Total of respondents by faculty

Fifteen (15) participants from four Faculties were interviewed, where five (33.3%) were from the Education Faculty, four (26.6%) from Science, three (20%) from Veterinary and three (20%) from Engineering. This sample does not include the two participants who belong to the Edtech sub-program.

Table 4.1: Respondents by faculty

Faculty	Number of lecturers interviewed
Education	5
Science	4
Veterinary	3
Engineering	3
Total	15

4.1.2 Demographic profile of respondents

In terms of gender, of the 17 respondents, 15 from faculties and two from the EdTech sub-program, seven (41.1%) were female and 10 (58.8%) were male. Gender representation is presented in Table 4.2.

Table 4.2: Respondents' gender distribution

Gender	Frequency %
Male	10 58.9
Female	7 41.1
Total	17 100

Regarding age, eight respondents (47.1%), were between 30 and 40 years; six (35.2%) were between 41 and 50 years; two (11.8%) were 51 to 60 and one (5.9%) was over 60 years old.

Table 4.3: Respondents' age distribution

Age	Frequency %
30-40 years	08 47.1
41-50 years	06 35.2
51-60 years	02 11.8
61 years	01 5.9
Total	17 100

4.1.2 Work experience as lecturers at UEM

A ranking of work experience (Table 4.4) shows that three (20%) had work experience between 0 and 5 years; 3 (20%) were between 5 and 10; five had 10-15 years of work experience; two between 15 and 20, and 2 had work experience of over 20 years.

Table 4.4: Respondents' experience distribution

Work experience	Frequency %
0-5 years	3 20
5-10 years	3 20
10-15 years	5 33.3
15-20 years	2 13.3
20 years+	2 13.3
Total	15 100

4.1.3 Experience with ET

Respondents varied in their experience of using educational technology in teaching processes (Table 4.5) as follows: four (26.6%) lecturers had experience with educational technology before workshops; five (33.3%) had limited experience; four (26.6%) had no experience; and two (13.3%) said that they were not sure what educational technologies were.

Table 4.5: Experience with ET in teaching process

Experience with ET in teaching process	Frequency	%
A lot of experience	4	26.6
Little experience	5	33.3
None	4	26.6
Not sure	2	13.3
Total	15	100

The second section of this chapter presents the findings according to the four research questions that guided the study. The first survey question was directed to the EdTech sub-program managers and two representatives were interviewed.

4.2 Strategies adopted by EdTech sub-program staff developers to encourage and support lecturers to make use of educational technologies

To better understand the strategies adopted to motivate teachers to use educational technologies, two representatives from the EdTech sub-program were interviewed. During the interview, respondents spoke of three strategies adopted to encourage teachers to use educational technology. The first strategy was to make faculty directors responsible for choosing the teachers who would attend the workshops; the second strategy was to invest not only in training but also in infrastructure and support; and the third and last strategy was the way they designed the workshops.

4.2.1 Strategy 1: Selection of experienced and interested lecturers, by the faculty directors

Faculty directors were asked to specifically invite lecturers experienced or interested in educational technology to join the workshops, because the EdTech team felt that, if this call for participation came from directors, the lecturers would possibly be more inclined to complete all four blended workshops.

When asked about the criteria used to select the lecturers who participated in the workshops, the two staff developer respondents were unanimous in stating that the choice of lecturers was the responsibility of the faculty directors. EdTech sub-program staff developers selected the four faculties that would be part of the training and contacted their respective directors to talk about the training and ask them to nominate the lecturers. One of them elaborated:

> *First, we presented the approach to the faculties to be the ones to indicate the teachers, especially those who already had a passion for technologies...The idea was that the selected teachers would be capable of giving continuity in the use of the technological tools* (Edtech 2).

In general, the participation of lecturers in the workshops was positive. This is a statement of the two interviewees who stated that, with the exception of some cases of lecturers who did not show much interest, the evaluation was positive and the training would be replicated in schools outside the Campus and in Maputo.

> EdTech 1: *In terms of participation we can say that it is positive, except for some teachers who dropped out and did not participate in the last workshops, but in general the evaluation is positive.*

EdTech 2: *The evaluation is positive, on one hand we don't have the capacity at the moment to be able to train all the teachers at once, which is why we set some goals that should be the basis of our work.*

EdTech 1 and 2: *At the end of each workshop, participants were asked to answer the evaluation questionnaire. Individual complete responses contain many interesting and relevant observations that should be analyzed during the review phase of the workshops.*

The class is not very large, which allows for personalized assistance between facilitators and participants...The facilitators present a methodology that encourages learning...The methodology used allows for better learning because it alternates theoretical and practical sessions (From anonymous evaluation of workshop).

The findings show that the strategies adopted by Edtech were carefully thought through to respond to the shortcomings of previous initiatives. Delegating the choice of lecturers who would be part of workshops gave the faculties autonomy to choose lecturers who could continue using the platforms, changing their teaching practices and training colleagues who have some limitations. This autonomy is followed by the improvement of infrastructure and the provision of necessary equipment to maximize the use of educational technology. EdTech brought a different approach including monitoring, in addition to training. The COVID-19 pandemic made some of the objectives of this sub-program unfeasible**.**

The choice of participants by the directors of the faculties is a positive strategy, as, in addition to getting to know their collaborators better, they know those who have been working with educational technologies in the teaching process.

4.2.2 Strategy 2: Providing infrastructure and ongoing support

To ensure the effective use of educational technologies by lecturers, the Edtech sub-program worked on strategies that were different and more motivating in relation to the various projects that had already been implemented at UEM with the same purpose, not only focusing on teacher training but also on improving necessary infrastructure and guaranteeing continued assistance. One of them said:

The difference is that the EdTech Sub-program proposes hybrid teaching, (combining teaching), but in addition to proposing combined teaching, the EdTech

> *Sub-program is also improving the infrastructure*. *What we did was to equip all schools and faculties at UEM with equipment that could stimulate teachers' use of educational technologies* (EdTech 1).

The second one added:

> *EdTech is an initiative that works with the whole university, I'm talking about schools and faculties, in the past, many initiatives were very specific, or they did testing in an organic unit without covering the whole university*…. *The approach that we have is to cover all the pedagogical components that are relevant for technology-based teaching and learning to be effective; that means, we are not just talking about blogging, we are talking about all educational technologies* (EdTech 2).

Despite this being a specific strategy, EdTech Sub-program was not asked by the lecturers to provide any assistance regarding the use of Moodle, and no monitoring was done to assess the extent to which what was learned in the workshops was being implemented by the lecturers.

With respect to support, according to the EdTech interviewees, no monitoring of the lecturers who participated in the workshops was done: "...*we haven't done monitoring" (*EdTech 1).

They only supported the lecturers through various mechanisms:

> *The support is guaranteed through the mechanisms that we have established, WhatsApp, email and telephone contact. It can be face-t- face or remote, via Zoom, that is to help them place the learning materials* (EdTech 2).

The above excerpts illustrate that the EdTech sub-program assisted when requested by the lecturers but did not have a monitoring system.

4.2.3 Strategy 3: Social constructivist workshop design

Each workshop was divided into two sessions, with time between sessions during which participants were expected to carry out homework to consolidate the knowledge acquired.

> *The workshops were designed in a hybrid model: the participants had synchronous sessions and completed the activities in asynchronous sessions as a form of practice. Unlike the other training already given at UEM, the EdTech workshops allowed the teacher to rehearse his discipline during the training* (EdTech 1).

An attempt was made to make the workshop practical and experiential as lecturers had the opportunity to work with Moodle. There was an emphasis on skills in Moodle. Lecturers created their subjects in Moodle and formatted them according to their preference or nature of the subjects. During the workshops, pedagogical components of learning design were also discussed so that teachers could not only focus on the skills they needed to acquire, but also on the challenges of learning.

Social constructivism allows the learner to build knowledge based on their reality. The nature of the workshops responded to the focus of this theory by assigning the participant the task of designing their discipline in MOODLE. However, lecturers who had no experience with the platform, had some difficulty fitting the (practical) content of their subjects on the platform.

4.3 Lecturers' classroom practices after the workshop series

The following section continues presenting the findings of the interviews with the 15 lecturers from Education, Science, Veterinary and Engineering Faculties. The lecturers were asked about their use of Moodle and other platforms that they have been using in their classroom practices after participating in the workshop series.

4.3.1 Use of Moodle in teaching and learning

When lecturer participants were asked to rank their frequency of Moodle use after the workshops, five (33.3%), three from the Education Faculty, with much educational technology experience, one from the Science Faculty and one from Veterinary with a little educational experience said that they used Moodle frequently after workshops;

three (20%) stated that they only used Moodle superficially, it was just used as an alternative platform to store course notes only and seven (46.6) never used Moodle after workshops (Figure 4.1).

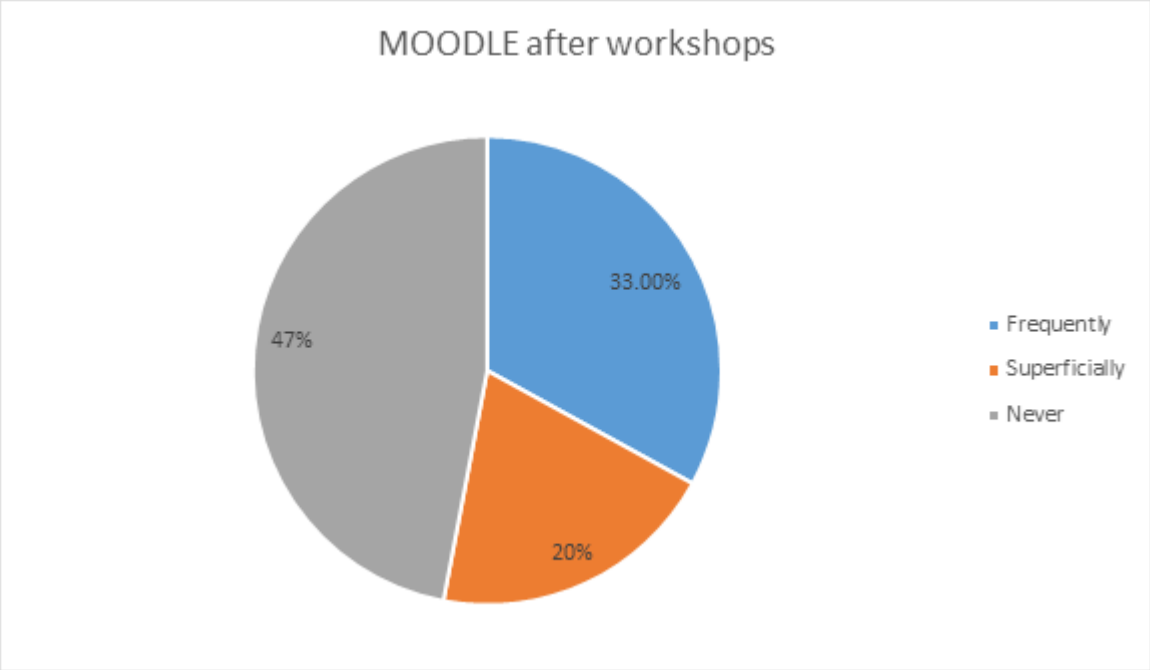

Figure 4.1*:* Use of Moodle after workshops

Table 4.6: Use of Moodle before and after workshops

Faculty	Participant	Use of ed tech before workshop	Use of Moodle before workshop	Use of ed tech after	Use of Moodle after
Education	Lecturer 1	Yes	Yes, distance learning	Yes	Frequently
Education	Lecturer 2	Yes	Yes, distance learning	Yes	Frequently
Education	Lecturer 3	Yes	No	Yes	Frequently
Education	Lecturer 4	Yes	No	Yes	No
Education	Lecturer 5	Yes	Yes, distance learning	Yes	Frequently

Science	Lecturer 1	Yes	No	Yes	Superficially
Science	Lecturer 2	Yes	No	Yes	No
Science	Lecturer 3	Yes	No	Yes	No
Science	Lecturer 4	Yes	Yes	Yes	Superficially
Veterinary	Lecturer 1	Yes	No	Yes	No
Veterinary	Lecturer 2	Yes	No	Yes	No
Veterinary	Lecturer 3	Yes	No	Yes	No
Engineering	Lecturer 1	Yes	No	Yes	Superficially
Engineering	Lecturer 2	Yes	No	Yes	No
Engineering	Lecturer 3	Yes	No	Yes	No

The table above shows that the use of Moodle varies from faculty to faculty, and most professors who used it later were those who already had some previous experience. The variation in faculties also illustrates what some professors mentioned about more practical courses, because engineering, for example, is one of the faculties that almost did not use Moodle.

One of those who used Moodle frequently elaborated on what they use it for: .

> *After the workshop, in distance learning, I still use Moodle, and in face-to-face teaching I have been using Moodle to combine teaching* [Lecturer 3 (EDU)]

Of the 20% who used Moodle superficially after attending workshops, Lecturer 1 (SCI) said,

> …*after the workshops I started using Moodle superficially*.

Whereas the majority (46,6%) of lecturers interviewed, stated that they never used Moodle after workshops due to various reasons. Lecturer 1 (ENG) shared:

> … *didn't like the pedagogical and learning design of the workshops; talked about many things rather than the functionality of Moodle.*

Lecturer 4 (SCI) reported:

> *After the workshops I didn't start using Moodle right away because I needed more time to practice The content was very complex.*

According to the respondents above, the content introduced in the workshops through Moodle was too complex for lecturers who had their first contact with Moodle. They felt it was not easy to understand and later implement in their subjects. These two participants constituted 13.3% of the total of 15 teachers interviewed. Neither of them used Moodle because they found it too complex. This complexity constituted a barrier. A platform like Moodle should not be too complex so that it can easily be used by teachers and students. It seems from these comments that, for some participants, there was not enough time to develop the necessary skills.

4.3.2 Additional platforms used by lecturers

Lecturers mentioned five platforms in addition to Moodle that they used after the workshops (which was also the COVID-19 pandemic period): Zoom, Google Classroom, Google Meet, WhatsApp and Facebook. Eight (8) (53.3%) participants – 3 from Science, 2 from Engineering and 3 from Veterinary – used Zoom, followed by 6 (40%) – 2 from Veterinary, 2 from Education, 1 from Science and 1 from Engineering – who used Google Classroom, 5 (33.3%) who used Moodle, 4 (26.6%) who used WhatsApp, 2 (13.3%) who used Google Meet ending with 1 (6.6%) who used Facebook, as illustrated in Figure 4.2.

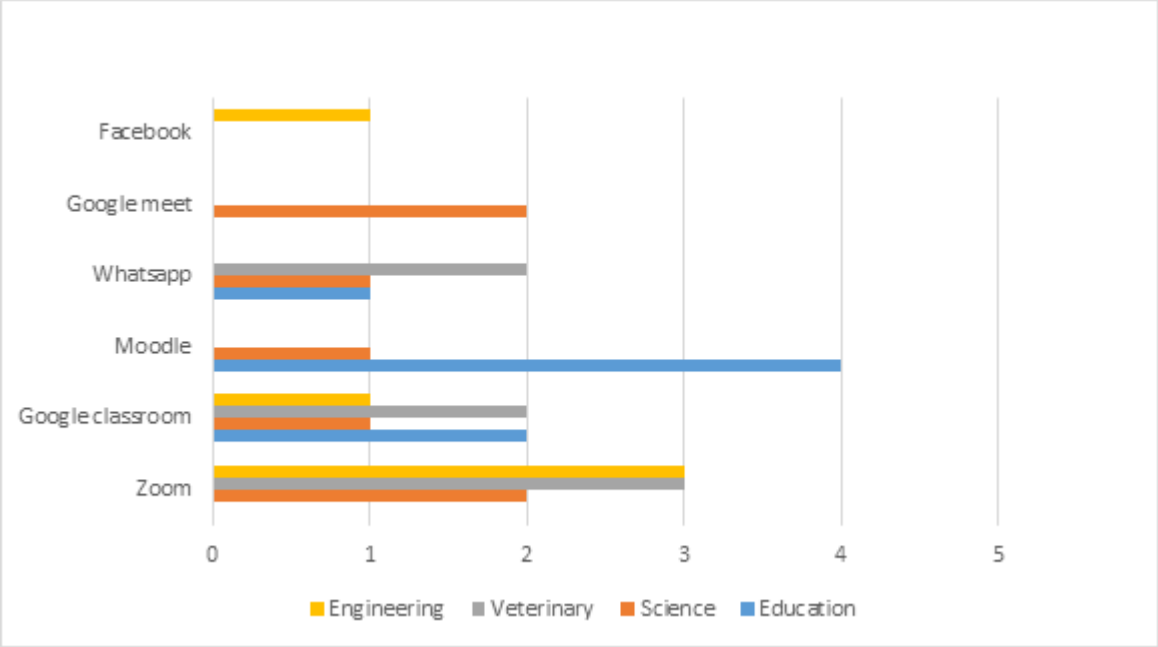

Figure 4.2: Platforms used by the interviewed lecturers

The pie chart in Figure 4.1 shows that the highest percentage of respondents, (47%) did not use Moodle. The graph above shows the teachers' preference in terms of platforms, which justifies the 47 percent of respondents who have never used Moodle. This may be associated with the lack of experience in Moodle and domain on other platforms; it may also be associated with the nature of the disciplines that have more practical content that requires simulations.

Figure 4.2 shows that the two platforms used the most by the interviewed lecturers are Zoom, with 8 (53.3%) and Moodle, with 5 (33.3%). Some lecturers 6 (40%) have combined different platforms according to their context.

Most of the lecturers who used Moodle after the workshops are from the Faculty of Education and were already working with this platform in distance learning. The workshops come to improve their knowledge in the use of Moodle as a learning resource.

4.3.3 Changes in classroom practices

Eight (53.3%) participants, including those who used Moodle superficially and frequently, made changes in their teaching practices through the use of this educational technology platform. Using this platform changed their way of teaching in

terms of methodology, the manner of interaction, the organization of content, and how to evaluate, which, in the researcher's perception, is part of innovation in the teaching and learning process.

> *My methodologies have changed, for example, the organization of classes. In the face-to-face classes' approach I was guided by an analytical plan and had to adapt the analytical plan for the online classes…. We have a discussion forum, asynchronous sessions where I propose a theme for discussion during a week, I log in to see what they are doing, I suggest corrections ...* [Lecturer 3 (EDU)].

> *They did change, because I had to adapt the contents to be taught on the platform, and in engineering most of the courses are complex*... [Lecturer 2 (ENG)].

Three (20%) respondents brought some innovative methods of teaching with technology to their classes. For these lecturers, the use of educational technologies requires constant creativity from the teacher.

> Lecturer 1 (VET): *They did change because, they replaced direct interaction; we share videos, we go on YouTube and share with the students and we didn't do that before in the face-to-face class approach.*

> Lecturer 3 (VET): *Yes, they did, in my class, mainly because it is a morphology class. I use a microscope to look at tissues, for example, and due to these platforms, I found out that I can use them to show things to the students and show that there are plenty of atlases available; the way you see an organ is different from looking at it using a microscope"*

Although almost all respondents agree that the workshops given by EdTech were an asset as preparation for the COVID-19 pandemic, there is still a deficiency in the use of Moodle by two of the faculties: Veterinary and Engineering. These faculties, despite having some knowledge about Moodle, have not been using Moodle for the teaching and learning process during the pandemic period; nonetheless they have been using other useful educational technology for the learning and teaching process. Veterinary lecturers, for example, stated that, because they have practical subjects and, in some cases, use a microscope and other equipment to show small particles in the classroom, they have found ways to replace this equipment on YouTube: they enter

into YouTube and identify the explanatory videos for the topic they are going to address and send the link to students. Students access, and the lecturer explains the topic based on what students are seeing in the video. They also stated that it is more productive because, in the classroom we were not able to cover the whole class because sometimes there is only one piece of equipment; now using these technologies the lecturer maximizes time, as all students follow the lecturer's explanation simultaneously with the available video.

4.3.4 Use of ET in times of COVID-19

Due to the current world pandemic because of COVID-19, educational institutions are forced to migrate from classroom to online classes. At UEM, this scenario was fortuitously preceded by workshops given by EdTech in which teachers from different faculties were trained in the use of educational technology, in particular Moodle.

All respondents who have used Moodle after EdTech blended workshops were unanimous in stating that the training was an asset, as it prepared the lecturers in the use of technologies in the process of teaching and learning, and it helped them much during this period when they were forced to teach online.

> *They were useful; the workshops were like a preparation, and as if there was already information about what was going to happen and it was good for me because I was already familiar with the technologies such as Moodle, I didn't have much difficulty migrating from face-to-face teaching to onlin*e [Lecturer 1 (SCI)].
>
> *A considerable advantage was for the ones who followed up*… [Lecturer 2 (ENG)].

4.4. Barriers/Challenges faced by lecturers using ET

According to the 15 lecturers, the barriers that have limited the use of Educational Technologies are as follows.

- **The infrastructure and internet (cost and bandwidth)**

Fifteen lecturers who account for (100%) said that the quality of the internet used in the Mozambican context is a very big challenge, especially at this time that educational institutions required employees to work from home.

> Lecturer 1 (ENG): *The network fluctuation… Unfortunately, our internet is not of good quality. Quite often, the students complain about the*

network inefficiency. [They say], "It took a long time to submit the work because the network is fluctuating."

Lecturer 4 (SCI): *First we can't deny the reality, we can't pretend because we are teachers, I am here talking but my internet is failing because I am at home.*

For two lecturers (13.3%) the improvements in the condition of UEM infrastructure made a big contribution to the use of educational technology in the learning and teaching process.

Lecturer 4 (SCI): … *not everyone has conditions to access these classes and some of our departments don't have conditions in terms of equipment. We need to have adequate infrastructure to meet the needs of the online classes".*

Six (6) lecturers (40%) indicated the cost of internet use is also a challenge for the use of educational technologies. For example:

Lecturer 5 (EDU): *The costs associated with using these technologies… If you have to work from home the costs are yours and that is complicated.*

Lecturer 2 (ENG): *On top of that, they say that they are told to work from home but the internet expenses are not covered.*

- **Equipment or devices and students' skills**

Six (6) participants (40%) responded that students and some lecturers don't have compatible devices to support these platforms, and, in these cases, there is no way to adhere to the use of educational technologies. They claim that students complain about the lack of cell phones or computers to attend classes using technology platforms.

Lecturer 1 (SCI): *…the lack of platform-compatible devices for the students….*

Lecturer 2 (EDU): *Students don't access it because they don't have compatible devices and therefore would prefer face-to-face classes.*

The difficulties presented by students regarding the use of Moodle and other educational technology platforms is another challenge mentioned by 4 lecturers (26.6%). For these lecturers, the university has been promoting the use of educational technology by training lecturers in the use of technology but the students did not have the same opportunity to be familiarized with Moodle or other platforms, and this creates resistance by students.

> Lecturer 3 (EDU): *The face-to-face students were not prepared for the new scenario: they were not trained to work on the platform.*
>
> Lecture 1 (ENG): *When it comes to the students, they are not ready for the platforms.*

- **Range of skills of co-lecturers in courses**

Working with colleagues, who did not have any training in the use of platforms, is a challenge faced by 2 (13.3%) of the interviewed lecturers.

> *The fact that I'm not working alone in a discipline doesn't give me the freedom to plan the discipline using Moodle or another platform because my colleagues didn't have the same training that I had and have difficulties in using these platforms. … Working with teachers who have not yet been trained* [Lecturer 1 (VET)].
>
> *As for me, a big challenge is that I would like to use a platform in which I have more time management. They are available but it seems as though many don't have the skills* [Lecturer 1 (ENG)].

The fact of working in a discipline with colleagues, who were not trained in the use of educational technology, was mentioned as a limitation, because the use of these technologies implies innovations in the discipline; however, it is complicated to innovate in a discipline shared with someone who hardly understands anything about educational technology.

- **Nature of courses or subject**

Twenty percent (20%) of respondents (3), 2 from Engineering and 1 from Veterinary, claim that the use of educational technology is not for all courses or subjects. In this case the complexity of courses or subjects is pointed out as a barrier to the effective use of educational technology in education.

In science courses it has not been easy to solve some exercises on the platform because of the nature of the courses; sometimes we need to go to the lab, and we can't do it online [Lecturer 1 (SCI)].

- **Lack of integrity (issues with assessment)**

One-third (33.3%) of respondents represented by 5 lecturers, 2 from Engineering, 1 from Education, 1 from Science and 1 from Veterinary, said that one of the big challenges in the use of educational technology is the lack of transparency. According to these lecturers, it is not easy to know who is on the other side of the computer as opposed to face-to-face lessons where the teacher is in permanent contact with students. This is especially a problem during assessments, as the online student can copy from resources, or even receive help from another student or friend or family member to complete the assessment.

Lecturer 2 (EDU): *We don't know if we are interacting with the student or with someone else because we can't see who is on the other side of the screen.*

The use of educational technology is conditioned by several barriers, as shown by the answers given by the lecturers interviewed in this study, and the quality of the internet is one of the most relevant challenges.

4.5 Mixed feedback from students

When asked about feedback from students on educational technologies three variables emerged. The first variable is **positive** – this variable was attributed for lecturers who said the feedback is positive as “accept” and use educational technologies. The second variable is **negative** – this variable was attributed to cases in which lecturers stated that students only use these technologies because they were forced by the COVID-19 pandemic, but preferred to continue with in-person classes. The third and last variable is **mixed**, where lecturers have some students who respond positively and others who have some financial and practical limitations.

Table 4.7: Feedback rating

Rating	Number of lecturers	%
Positive	5	33.3
Negative	4	26.6
Mixed	6	40
Total	15	100

The 33.3% of respondents claim that the feedback from students is positive based on the type of interaction they have had with the students, they also state that, in some cases, it is the students themselves who suggest the platforms and the modality to be used on these platforms.

Lecturer 3 (VET): *The acceptance is positive, except for those who do not have devices compatible with the platforms, but generally the acceptance is positive.*

Lecturer 3 (SCI): *They are the ones who even suggest that we have online classes because it somehow reduces their exposure, especially at this time of the pandemic.*

The percentage of respondents who rated the feedback negatively, was 26.6%, for these lecturers' students are attending lessons using this platform because they are forced by the pandemic but they prefer traditional face-to-face lessons. However, even though forced by the current situation, the decline in student numbers in classes is remarkable.

In the beginning it was difficult for them to accept them, but then they started to accept because they no longer had a choice. Others even went to their classmates' homes to take class [Lecturer 1 (EDU)].

It's not positive yet because students have a lot of limitations in terms of internet access and resources to access classes and they have not been trained and it limits them somewhat [Lecturer 3 (SCI)].

Importantly, the largest number of respondents for this question (40%) say that feedback is positive on the one hand and negative on the other because they are faced with a group that accepts and another that still resists for various reasons already mentioned. Lecturer 4 (SCI) said:

> *The feedback is positive, although we have young and adult students and most of them are young and like technologies, they like challenges, although they take advantage of the fact that it is online to justify the delay in submitting work. ... Some of my students say they would like to be in a face-to-face classroom but still adhere which enables independent work for them. ... We can say that the feeling is mixed.*

The answers show that students are receptive to the use of technologies, however, the lack of resources, such as the cost of internet and the availability of devices to use these technologies, are a challenge that limits many students in accessing online classes causing them to have a preference for face-to-face classes.

4.6 Technical support

Two-thirds of the interviewed lecturers (10 - 66.6%) stated that they received technical support. The support was provided by the faculties, by UEM Computer Center (CIUEM) and by colleagues. The other third did not need support and therefore they did not contact CIUEM.

Table 4.8: ET support

Do you have access to technical support in the use of these technologies?	**Technical support**		
	Faculty	**CIUEM**	**Colleagues**
Yes	10	2	2
No	0	0	0
Never request	5	0	0

When respondents struggled with the use of ET, they stated that, in addition to the support they received from the faculty, there are colleagues who are always available to help.

> *I can say yes, we have an IT department in the faculty, even the facilitators themselves have always been available to clarify any doubts* [Lecturer 4 (SCI)].

> *EdTech has always been available, I have never contacted them because I have never faced huge difficulties. In the faculty we have teacher Xavier who has supported in this regard* [Lecturer 2 (EDU)].

Support is one of the strategies adopted by the EdTech sub-program to encourage the use of technologies by lecturers. The responses given by them show that support was always available even though many lecturers recognized that they never asked for support.

4.7 Advantages of educational technology

Overall, the main advantage that respondents see in the use of educational technologies is that classes can be given from anywhere.

> *I can give my classes from anywhere without having to go to the faculty* [Lecturer 3 (VET)].

> *You can access classes from anywhere. For example, there were students who were in Nampula, Zambezia, Sofala; they didn't need to be there face-to-face* [Lecturer 1 (ENG)].

The potential extended interaction with students, which can happen during the class period or after it ends, throughout the day or week, is one of the advantages of using technologies in the teaching and learning process that was pointed out by seven lecturers. For these lecturers, the platforms allow them to promote debates that can extend beyond class hours, and this allows students to be in permanent contact with lecturers as they can enter the online learning platform at any time. Lecturer 3 (EDU) said:

ET puts the student in permanent interaction with the teacher and with other colleagues...The class can be extended beyond the allocated time in the schedule, since the contact can continue even after the scheduled class.

The respondents felt that technology enabled a better use of time and freed up time for other activities because classes can be scheduled and placed on platforms and can be accessed at any time without the presence of the lecturer.

It allows more time for other activities…. [Lecturer 1 (VET)].

It is very flexible to have online classes and it helps us to have time for other activities [Lecturer 3 (SCI)].

The use of educational technologies provides more freedom to students. This is an advantage pointed out by three respondents, who stated that because there is no physical contact with the student this allows them to feel freer to interact with the teacher and colleagues.

[Educational technologies] help those students who are afraid to talk in class; when we are online they are more comfortable to interact [Lecturer 1 (SCI)].

Because of the COVID-19 pandemic and the various levels of lockdown, technologies have become a fundamental tool for the teaching and learning process, as the use of these technologies has the advantage of reducing the exposure of students and teachers to the various ways of contracting COVID-19. This statement was given by five respondents who are part of the 15 lectures interviewed.

… *reduces the risks of exposure to COVID-19...* [Lecturer 4 (EDU)].

The advantage that I see so far is the reduction of the contamination risk because they can reduce the level of physical contact with the student [Lecturer 2 (ENG)].

Lecturers 1 and 3 (EDU) became more creative with the use of educational technologies. To these lecturers, the use of educational technology has forced them to be creative.

Another advantage of technology is the ability to record lectures; students can access them at any time and the teacher can improve their performance by making a self-assessment of their class.

> *The teacher can record the lessons and the students can have them available even after the lesson*… [Lecturer 1 (ENG)].

There are lecturers who shared the innovations they brought to their classes using technologies and the level of satisfaction they had was evident.

> *We share videos, we go on YouTube and share with the students and we didn't do that before in the face-to-face class approach* [Lecturer 1 (VET)].

This shows that the use of ET has numerous advantages for the teaching and learning process and its use brings a new dynamic to classes.

4.8 Moving to ET use across UEM

Thirteen (86.6%) of respondents were unanimous in stating that they recommended the use of ET to other teachers who, for some reason, still have a certain "resistance":

> *I understand their inertia, change is not that easy, now the effort they put into teaching 3 classes can be reduced to a single class and, as a result, time is saved. Mainly during this pandemic period, it is important to use* [Lecturer 3 (ENG)].

> *We are moving towards a teaching approach that is not going to be limited to the classroom. I recommend it because the teachers who have some different opinion are going to end up being outdated in time because the technology is there and the current environment is going to exclude itself* [Lecturer 1 (EDU)].

Some lecturers, as a way to motivate colleagues in the use of technologies, have, during the formatting of their subjects, invited colleagues to follow the process and become familiar with the diversity that the platforms offer.

> *I am modifying my subject and inviting some colleagues to watch. Who knows? By watching they might feel motivated, because the hard thing is preparing the material, as soon as all is set up, it makes everything easier* [Lecturer 3 (VET)].

4.9 Summary of the chapter

The findings show that there is still an inconsistent use of educational technologies by UEM lecturers. Two of the four faculties (Engineering and Science) that were part of the research started to use educational technologies in the teaching and learning process only because they were forced to do so during the COVID-19 pandemic. Even after having been trained in the workshops on the use of Moodle, they would not have been using the platform or any other educational technology, had they not been forced to migrate from face-to-face teaching to online teaching. This reluctance is perhaps unexpected from teachers at the most well-resourced, largest and oldest Mozambican university.

The main objective of this research was to investigate the effectiveness of the approach introduced through the workshops by EdTech Sub-program in the teaching and learning process through the use of educational technologies. It was thought this could be measured by considering which participants changed their classroom practice to include technology. The findings show that from three of the four faculties (Education, Science and Engineering), 46.6 percent of respondents used Moodle before and during the pandemic, and the largest percentage of faculty who have used Moodle were from the faculty of Education. The Faculty of Veterinary, Science and Engineering used other platforms, predominantly Zoom and Google Classroom. In the Faculty of Sciences lecturers only used Moodle due to the pandemic, and there were others who, even with the pandemic, opted for other platforms. Most of them did this because of their disciplines, as these platforms allowed them to do simulations of more practical content to share with the students.

The barriers in the use of these technological platforms in education mentioned by lecturers negatively influence their effective use. There is also a certain resistance among lecturers to the use of educational technologies justified by the complexity of courses in some disciplines. There are also lecturers who rely on technologies in their teaching practices and report that the results are satisfactory and encouraging.

CHAPTER 5: Discussion

5.1 Introduction

In this chapter, the qualitative data presented in Chapter Four are discussed in relation to the four research questions defined in Chapter One, and clustered around themes that emerged from these questions. In this section, the results are discussed based on the literature review on educational technologies and their implications for teaching and learning.

The EdTech sub-program used multiple strategies to encourage the use of educational technology at UEM, such as, choosing participants with educational technology experience, working across the whole institution, providing infrastructure and technology support, blended workshops and using a constructivist approach to learning design. Changes or lack of changes implemented by lecturers in the use of technology in teaching and learning, barriers faced by lecturers and examples of successful use of these technologies are addressed. Although the results show similar barriers for all lecturers of the four researched faculties, there are divergences in the practices of each lecturer in relation to educational technology and in their conception of the advantages of using these technologies.

The aim of this study was to investigate the success of the new multifaceted approach to integrating educational technology presented by the EdTech Sub-program.

5.2 EdTech sub-program: a pilot multifaceted social constructivist approach

The findings show that, from the conception of the sub-program, the EdTech staff developers were careful to analyze previous initiatives implemented at UEM in order to identify shortcomings and design strategies to achieve their objectives. This is a strategy supported by Alammary, Sheard and Carbone (2014) when they stated that selecting the most appropriate design approach for a blended course is a major challenge for many universities.

5.2.1 Strategy 1: Choose participants with educational technology experience

The first strategy that EdTech Sub-program adopted was to ask Faculty Directors to choose lecturers with some experience in educational technology or lecturers who had

were interested to ensure continuity in the use of educational technology after the workshops. However, findings reveal that the range in participant experience, some with and some without any experience, allowed lecturers to have differentiated experiences of the workshop series. This resulted in participants with no educational technology experience struggling to keep up and understand the content of the workshops. Unfortunately, this resulted in the subsequent non-use of these technologies in the teaching and learning. In order to ensure the success of the project, workshops were designed based on the experiences and motivations of the participants, which allowed them to be autonomous as adult learners and make changes in the way they learnt and practiced as lecturers (Carr et al., 2008). Experiential learning theory argues that learning requires skills that the learner can continually use to facilitate their learning. The fact that there were teachers with no previous experience in educational technologies may have contributed to the non-use of educational technologies after the workshops. Although some of the participants did not find the best way to fit their content into educational technology tools (Engineering and Veterinary), maybe because they did not identify the need to use technology in the teaching and learning activity. Experiential learning theory provides an explanation: there was no transformation of the experience into learning since they had no previous experience in the use of these technologies, which negatively influenced the change in educational practices (Kolb et al., 2015).

5.2.2 Strategy 2: Infrastructure and technology support

Another strategy introduced by the EdTech sub-program in addition to offering workshops, was aimed at improving infrastructure, providing equipment, and training not only lecturers but also technicians in areas relevant to the effective use of educational technology. This positioning of EdTech converges with what Jung (2005) proposes as an effective strategy to encourage the use of educational technology by lecturers. For the effective and efficient use of technology in education, lecturers need opportunities to apply them, training and just-in-time support, and conditions to implement them. EdTech's proposal was not just to train lecturers as was done in the previous blended and face-to-face project in the Faculty of Education (Muianga, 2005). The EdTech sub-program includes in its plan all the faculties and schools of UEM.

This strategy was used to ensure that there was greater coverage in the use of educational technology at UEM.

5.2.3 Strategy 3. Workshop design

The four blended workshops were not taught all at once: workshops one and two were given first to allow participants time to apply the knowledge gained from previous sessions and be prepared for workshops three and four. This strategy is sustained by Carr et al. (2008) as they claim that it is important to respect the learners' time constraints, the level of commitment and opportunity to give the lecturers autonomy to make changes in their learning and practice. This strategy was combined with a constructivist approach. The choice of constructivism by EdTech has influenced the later use of educational technology by lecturers. According to Allsop (2016), the constructivist approach encourages lecturers to design and learn activities in an authentic context so that learners will engage with the lessons, which allows lecturers to frame the lessons learned in the workshops in their teaching and learning context.

However, the results show that the constructivist approach by itself was not enough because working with adults who have different values and beliefs can influence the results of the workshops. The community of practice emerges in this study during the interviews where some interviewees stated that they have shared their experience in the use of technologies with colleagues who did not participate in the workshops to build a community of teachers in their faculties. The literature suggests that more than one approach is employed in training, and one of the suggestions presented by Cox (2015) is experiential adult learning theory that states that the essence of adult learning is making sense of experiences. According to this theory, to better learn, adults need to relate what they learn to their daily practices before even understanding what they are learning. A lot of activities were designed to discuss the best way to apply the learning in workshops for the participants according to their reality. If they do not recognize the need for that content for their lives, they will hardly put into practice what they are learning. That is why participants were working on their courses during the workshops sessions, so the activities were authentic and this encouraged situated learning. Although the workshops included pedagogical aspects and the main learning challenges, the results showed that the teachers were not always focused on the theoretical part of the training, but on developing skills in the use of Moodle.

5.3 Moodle use after the workshops

Participation in the workshops was considered positive by the project leaders, but the results presented in relation to the use of Moodle after the workshops are contradictory: only 33.3 percent of interviewees used Moodle frequently after workshops, and some of these lecturers only used Moodle because they were forced to migrate from face-to-face to online teaching to contain the spread of COVID-19. The fact that experienced lecturers and others without experience participated in the EdTech sub-program workshops was important because it contributed to collaboration and exchange of experience between them. Another interesting factor that the results showed is that only lecturers from the Faculty of Education used Moodle after the workshops, while lecturers from the Faculties of Engineering, Science and Veterinary started using educational technology only after the outbreak of the COVID-19 pandemic, i.e., they were "forced". The Education Faculty participants arrived at the workshop with more experience having been involved in previous workshops because some of them had been using Moodle for distance learning before the EdTech Sub-program.

The workshops were not 100 % successful in changing the practice of participants. One main reason was that many participants lacked any previous experience of using educational technology. This was not according to the plan where the EdTech Sub-program had requested that Faculty HOD's only put forward participants who were already using educational technology.

5.4 Changes in classroom practices

The changes made by teachers in their classroom practices differed between the two groups: the group of those who used Moodle frequently and those who used it superficially, because in the first group, most of the lecturers had already been working with Moodle. in distance learning and participated in workshops to improve their mastery in the use of some tools on the platform.

However, being the EdTech sub-program, a blended teaching approach, the group of lecturers who belong to the active users of Moodle explained that they did not find a relevant barrier to the use of educational technology, they have redesigned their distance learning subjects and created the face-to-face teaching subjects in Moodle

In addition to the motivation they brought, they became an active and creative group in the use of Moodle. These findings are similar to those of Adewumi et al., (2011) in the “eLearning Fellowship Program”, where the authors stated that the greatest motivation of the participants in that program was the possibility of developing new skills in the effective use of technology for teaching and learning.

There are lecturers who changed their practices superficially. The main motivation for these lecturers was the spread of COVID-19. With the brusque interruption of face-to-face classes, they were forced to move to online lessons. The changes they made using Moodle were not very significant. Since they had already set up one of their subjects during the workshop sessions, what they did was use Moodle to post some information on the forums, and they taught classes using other platforms, such as Zoom and Google Classroom. They developed skills on other platforms that they considered more accessible for their subjects, and redesigned their classes to better fit these platforms.

5.5 Adoption of additional educational technology tools after the workshops

There were lecturers who used Moodle since the workshops; for them the training enabled creativity and inspired them to try new tools to streamline the teaching and learning process. For some, the design of the workshops was effective and, despite the internet limitations that still exist, there is interest on the part of these lecturers in the use of educational technology. Williams (2010), Strecker et al., (2018) and Mahaye (2020) are authors who support the motivations presented here by the lecturers, when they state that the use of educational technology has the potential to encourage lecturer creativity and enhance their educational practices. For this group of lecturers, the first strategy adopted by the EdTech sub-program as a way to promote the use of technologies at UEM was effective. The choice of the constructivist approach allowed these lecturers to be inspired and, from the workshops, build new knowledge in the field of educational technology that could bring innovations to the teaching and learning process. This change is explained by adult learning theory that emphasizes that adults produce better learning results when they bring previous experiences about the content to be covered. The experience is a catalyst for adult learning (Cox, 2015). It was this experience that contributed to this group of lecturers implementing educational technology after the workshops.

5.6 Using educational technology before and after workshops (educational technology background)

Lecturers with some experience in educational technology who participated in the workshops were part of the group of lecturers who continued with their practices even after the workshops. Participation in training adds more value to the knowledge they already brought and for, this reason, they added to their practices not only in the use of Moodle but also other platforms to help the teaching and learning process. As Ali (2020) and Mishra et al. (2020) claim, Moodle is not the only platform that can be used to promote educational technology, there are other platforms that can be used according to the nature of the course or subject.

The EdTech sub-program asked Faculty Directors to choose lecturers with some previous experience in educational technology, who were more likely to increasingly boost other lecturers from UEM in the use of educational technology. The fact that most had already used educational technologies before participating in the workshops allowed them to develop their skills and overcome barriers that could inhibit the use of these technologies. The lecturers who continued to use educational technology after the workshops justified their practices with some advantages that are notable for them when they teach using educational technology (lecturers who changed their practices as a result of the workshops and those who continued after the workshops because they already had some experience with educational technology). During the interviews lecturers explained that, in addition to making the teacher more creative (Strecker et al., 2018; Mahaye, 2020), the use of technologies allows for greater interaction with students (Arkorful & Abaidoo, 2010) and allows for better time management (Holmes & Gardner, 2006) and to support their claims they suggested examples of how to encourage other lecturers to effectively use educational technology and show how the use of educational technology positively changed the teaching and learning process. In a class that previously used a microscope to show students particles that were not visible to the naked eye, this instrument was replaced by a YouTube class where the student had the possibility of seeing the particles or objects in high definition accompanied by a detailed explanation. The lecturer stressed that the students were unanimous in stating that they preferred that interaction with YouTube over using a microscope, which took more time.

5.7 Adoption of educational technology because of COVID-19 online pivot

Some lecturers started using Moodle or other educational technology platforms only after the pandemic because they were “forced” to migrate from face-to-face to online teaching to contain the spread of COVID, which suggests that, even after actively participating in the workshops, lecturers did not transfer the learning to their teaching practices. Even though they are “forced” to use the technologies, Moodle is not at the top of the platforms that the interviewed lecturers have used. The platforms that are most used by the interviewed lecturers are Zoom, WhatsApp and Google Classroom, with similar findings in other studies over time of COVID-19 (Martins et al., 2021; Uacane & Pego, 2021). The choice of these platforms was related to students' lack of familiarity with Moodle, and, to ensure greater inclusion, lecturers had to choose the platforms that could be within the reach of students in terms of cost, ease of downloading to their devices and ease in interaction.

It seems that, for some faculties, Moodle, which is the platform that EdTech Sub-program promoted in the workshops, has not been functional and this may be related to a perceived complexity of the courses. 20 percent of respondents stated that the time was not enough for everyone to create or learn the Moodle contents necessary for implementation in teaching practices (Yidana, Edwards, Boison, Wilson & Sanfo, 2013).

5.8 No adoption of educational technology

The non-use of educational technologies even after the workshops was justified by the lecturers as being a result of the numerous barriers faced by them. The findings show that, although there was willingness on the part of lecturers to use the technologies, there were challenges that discouraged the process, and one of the main barriers that was mentioned by all respondents was the poor quality of the internet, a barrier seen in many contexts (Hannessy et al., 2010; Rambe & Mawere, 2011; Gregory, Scutter, Jacka, MacDonald, Farley & Newman, 2015; Kandiero, 2015) The barriers faced by the interviewed lecturers in the use of educational technology at UEM overlapped with some of the barriers found in the literature review.

Gilakijan (2013) argues that the lack of material support is one of the factors that negatively influences the use of technologies and suggests that teachers who use

technology in the classroom need support from experts. The non-use of technologies after the workshops is also associated with a lack of experience and Okojie, Olinzock, Boulder (2006) propose the introduction of follow-up activities after the training.

5.8.1 Internet and infrastructure

As the internet is one of the essential components for blended education, it is important that it is always available and it should be reliable (Sife, Lwoga & Sanga, 2007; Cox, 2008; Abrahams, 2010; Buchanan, Sainter & Saunders, 2013; Newman, 2015). Lecturers noted the constant fluctuations in internet availability and the fact that not all students have internet access derailed many attempts to include educational technology in teaching.

This challenge is not the fault of UEM or the EdTech sub-program but rather it is a problem related to the conditions in the country itself.

5.8.2 Teacher skills and resistance to change

Developing the teacher's skills necessary for the use of educational technology is essential to promote their effective use. This was an element that the EdTech Sub-program identified as a focus and to respond to this need promoted the workshops. However, there is a contradiction here, as one of the barriers that was raised during the interviews is the lack of skill on the part of lecturers in the use of technologies. This lack of skill is ubiquitous as a barrier to change of practice (Rambe & Mawere, 2011).

Resistance to change is one of the barriers that also limits the use of educational technology. Lecturers, in some cases more senior lecturers, who did not have the technology component in their training and who have been working for many years in the traditional model, have difficulties in introducing educational technology into the teaching and learning process (Abrahams, 2010; Johnson et al., 2017). Resistance to change may be related to the fact that teachers do not see educational technology as a necessity in their daily lives as teachers According to Kaufman (2003), one of the andragogical principles of adult learning is that "[t]hey value learning that integrates with the demands of their everyday life", and not all workshop participants had experience in using educational technology, which on one hand contributes to their resistance (Sife, Lwoga & Sanga, 2007; Quinn, 2009; Mtebe & Raphael, 2017).

5.8.3 Devices and students' skills

Respondents who did not use Moodle after the workshops explained that not all students are able to have a device that allows them to access classes, and those who do have devices do not know how to use them. Lecturers were not trained to train students, nor were they given time to train the students. In this context, as a way to avoid exclusion, they preferred to continue with traditional methods of teaching (Muftahu, 2020; Anifowoshe et al., 2020).

The lack of preparation for the use of educational technology by students is a challenge that Mishra, Gupta and Shree (2020) point out as a constraint on the use of educational technology by teachers. The fact that the lecturer takes more time to explain to the student how to access a certain platform, for example, how to submit a paper, may make them prefer to work in face-to-face teaching where the student arrives and sits down, and the teacher leads the class focusing only on the contents of the discipline.

5.8.4 Complexity of courses or subject

The workshops offered by EdTech were focused on developing lecturers' pedagogical skills through the use of educational technology focused on blended teaching and learning. However, most teachers who participated in the workshops focused on developing skills in the use of Moodle, which limited the exploration of various technologies that the workshops offered. This, somehow, limited lecturers who, according to them, work with complex courses and who did not learn during training how to frame these courses in Moodle, and this contributed to their not using the educational technology, specifically Moodle. This situation suggests that there is a need to combine different platforms for use by teachers, as this will allow the teacher to identify the platform that best fits the nature of the course or subject that they teach (Ray, Bala & Dwivedi, 2020). However, some lecturers stated during the interviews that, even when working with complex courses or subjects, it is possible to use educational technologies. One of the examples given was the replacement of the microscope in a class with YouTube videos showing microscopic organisms. The students seemed to like these innovations and encouraged the lecturer to bring more innovations like this into teaching [Lecturer 3 (VET)].

5.8.5 Integrity issues with assessment

Another reason given to explain the resistance to the take up of educational technology is the apparent lack of transparency in assessment (there is no way of guaranteeing that an online written test has been taken by the student alone without any help) which, for some lecturers, discredits online assessment. One of the interviewees [Lecturer 2 (EDU)] felt unsure about assessing students online. They felt it is difficult to know who is taking the test if there is no proctoring. Because of this discomfort lecturer prefer to evaluate using traditional models without the help of any educational technology (Chanpet, Chansuwan & Murphy, 2018). Kaur, Singh, Mahajan, Lal, Singh and Kaur (2020) suggest that, to evaluate using educational technology, lecturers need to be creative and investigate different ways of evaluating using technologies.

5.9 Summary

Barriers to change in practice can exist in any field, especially when new approaches or methodologies are implemented. The use of educational technology in the teaching and learning process can depend on the motivation of the teacher to use these technologies, as illustrated in the results, there are lecturers who voluntarily used educational technology with great naturalness and mastery. That means that there are barriers that can easily be overcome if there is engagement on the part of those involved in the teaching and learning process. Some aspects discussed in this chapter are related to theories that contribute to the use of educational technology by teachers, such as the case of adult learning theory, which emphasizes the experiences of respondents as catalysts in the use of educational technology.

Social constructivism also has its contributions in this process, as it is a theory that emphasizes that the learning is social and culturally constructed. The combination of these theories in teacher training programs can contribute through community of practice theory that suggests that lecturers share experiences in the use of educational technology. This sharing can help to overcome barriers, such as resistance to change, lecturer's skills and complexity of courses or subjects, and promote the use of educational technology at UEM. Resistance to change is one of the barriers mentioned by lecturers as a factor that does not contribute to the communities of practice of use

of educational technology because there are situations where there are two or three lecturers who work in the same subjects, but there is difficulty in using these technologies if one or two of them are not familiar with them.

CHAPTER 6: Conclusions and recommendations

In this chapter, conclusions and recommendations are drawn from the findings based on the research questions. The findings are based on the literature review and interviews with lecturers in order to better understand the use of educational technology in the four faculties that were part of the workshops offered by the EdTech Sub-program. This study also made it possible to present some recommendations for University Managers, for EdTech sub-program managers and for lecturers as users of educational technology.

This study included 17 participants, 15 lecturers who took part in the workshops of the EdTech sub-program distributed across 4 faculties (Education, Veterinary, Engineering and Sciences) and 2 representatives of the EdTech sub-program. This small sample size may represent a limitation for this study. However, as this is a qualitative study that focused on collecting the perspectives and experiences of lecturers regarding the use of educational technology in these faculties, the sample was representative and provided insight into the degree of use of technologies by lecturers. The in-depth qualitative interviews clearly highlighted the main barriers that contribute to the inconsistent adoption of technologies in the teaching and learning process.

The aim of this dissertation was to investigate to what extent the strategies presented by the EdTech sub-program contributed to the use of educational technology by the lecturers of the four investigated faculties at UEM. There is a willingness on the part of some lecturers to use the technologies, but there are not only institutional but also personal barriers that limit the use of educational technology. The choice of better strategies in the personal development of lecturers in the area of technologies is essential to ensure their effective use by lecturers. The EdTech sub-program attempted different strategies to previous staff development projects encouraging lecturers to combine educational technology in course objectives and course design. No one could have predicted the COVID-19 pandemic which began shortly after the workshops were completed.

6.1 The new multifaceted, constructivist approach of the EdTech program to enable lecturers to use educational technologies in teaching and learning at UEM

The purpose of this study was to investigate the possible effect of the Educational Technology (EdTech) sub-program for academics from four faculties at Eduardo Mondlane University. In summary, the workshops promoted by the EdTech sub-program added value to the lecturers who took part in the training; thus, mainly with the outbreak of the COVID-19 pandemic, lecturers could easily migrate from face-to-face classes to online classes, which ensured that classes were not interrupted at UEM. Some lecturers reported that participating in the workshops helped them to improve their practices using educational technology, bringing more interaction with students into their classes. We conclude this study by stating that there are basic conditions for UEM lecturers to use educational technology in the teaching and learning process, and each stakeholder involved in the process (managers, lecturers, students and employees) should do their part to promote the use of educational technology in the university.

6.2 Strategies adopted by the EdTech Sub-program encourage and support lecturers to make use of educational technologies

6.2.1 Choosing lecturers with previous educational technology experience

Choosing lecturers who already had some experience using educational technology was a good strategy but, in practice, many of the lecturers came into the workshops with no experience. This lack of experience meant that there was a big learning curve that proved too challenging for some participants. They struggled to make the shift to adopting Moodle. Lecturers who arrived in the workshops with past experience were, in some cases, motivated to try new tools and were more comfortable making the transition to an increased use of educational technology. Some lecturers stated during the interviews that the “University” does not recognize the effort they make when teaching with technologies, the example of this is that during the peak of the pandemic there are lecturers who taught with technology resources and others who interrupted classes because they did not want to teach in the online model. However, when face-to-face classes gradually resumed, the lecturers who had taught online were forced to start over and invalidate all the effort made. I believe that the first step should be the complete acceptance of online teaching, recognizing the classes given in this modality, as well as the obligation to include synchronous activities in the teaching and learning process. Associated with this obligation must be support and follow-up at all levels, because what has happened is that teachers are trained but no follow-up is carried out in the implementation of what has been learned.

6.2.2 Improving bandwidth and infrastructure on campus

Investment in basic infrastructure was the second strategy identified by the EdTech program. Infrastructure was put in place to improve bandwidth and facilities and laboratories were equipped with computers for lecturers to use. A support network was put in place to help lecturers, particularly in the management of Moodle. This support was not used because the lecturers did not request help, and there was no follow-up after the workshops

6.2.3 Social constructivist informed workshop design

The Edtech sub-program carefully designs workshops to build in interactivity and practical experience. Four blended workshops were designed, where teachers, with the pedagogical support of the facilitators in the use of technologies, practiced

presenting their courses using Moodle. Presentations and videos were made available to allow participants access to various resources to assist in the learning process. Moodle was embedded in the design and gave participants a hands-on experience of how it works and an opportunity to create a mini-course using the platform. This social constructivist design had the best intentions and, for participants with experience and an enthusiasm for technology, it worked and those participants learned new skills and increased their use of educational technology in the classroom (Carr et al., 2008; Allsop, 2016). It seemed, though, that no matter how thorough and thoughtful the learning design was, if participants had no experience with educational technology, they floundered.

The results of the study combined with the literature review show that the theory of social constructivism adopted by the EdTech sub-program could have been combined with the theory of adult learning (; Cox, 2015). Lecturers could also have been supported by using the principles of community of practice in order to support one another.

6.3 Changes made by lecturers in their classroom practice after attending the workshops of the EdTech Sub-program

The changes made in the classroom by lecturers using educational technologies were not very significant before the pandemic period. The poor use of Moodle after the workshops was justified by the lecturers as being a result of the complexity of the contents that were given in the workshops, the complexity of the subjects they teach and the nature of the courses that were not in accordance with the Moodle framework learned in the workshops. A third of the lecturers who used Moodle after attending the workshops said that the changes they made were related to methodologies and the organization of content, and they integrated some innovations into their teaching practices at this time of the pandemic. The change in practice was not just using Moodle but also the inclusion of other platforms that, according to these lecturers, were easy to configure for the subjects they teach. One of the examples was the use of YouTube to streamline the teaching and learning process. The use of YouTube was proposed by the 2020 World Bank as an auxiliary and innovative means for the teaching and learning process during the pandemic period (Jena, 2020).

6.4 Barriers faced by lecturers in using educational technology

The main barriers that affect the use of educational technology by lecturers at UEM, particularly in the Engineering, Education, Veterinary and Science Faculties, are similar to those mentioned in the literature at a global, regional and national level (Sife, Lwoga & Sanga, 2007; Cox, 2008; Abrahams, 2010; Rambe & Mawere, 2011; Buchanan, Sainter & Saunders, 2013; Newman, 2015; Johnson, Jacovina, Russel & Soto, 2017; Anifowoshe et al., 2020). Barriers, such as internet instability and lack of infrastructure, lecturers' poor digital skills and resistance to change, course complexity, students lack of equipment to access classes, and assessment challenges were mentioned by the lecturers from the four faculties.

This resistance to change can be explained using adult learning theory as a lens. Adults learn better by building on past experience and, therefore, the lack of prior experience in using educational technology was a barrier to learning. Lecturers design and plan their classes based on past experiences to facilitate the teaching and learning process, when they are faced with a situation that is not part of their initial experience they tend to withdraw, which can contribute to resistance to the use of educational technology. This barrier can be overcome through collaboration between the most active users and the most resistant ones to motivate them to use educational technologies and, thus, promote a community of practice. According to Williams, Slay and Sierborger (2008), a community of practice may facilitate the potential of working in collaborative groups through the exploration of the affordances that ICTs offer in supporting learning within the university and in cooperation with the community.

6.5 Examples of the successful inclusion of educational technology in learning and teaching

Despite the barriers mentioned by respondents as the factors behind the "weak" use of educational technology in UEM, there are encouraging examples (teaching using YouTube; replacement of the use of microscope for virtual classes that illustrate organisms not visible to the naked eye) of lecturers who said they could not imagine ever going back to work without the use of technology for teaching. Educational technology puts the student in permanent interaction with the teacher and with their peers.

6.7 Implications

Beside the lessons learnt above, a future workshops training approach should be focused on the use of the combination of three theories (Figure 6.1).

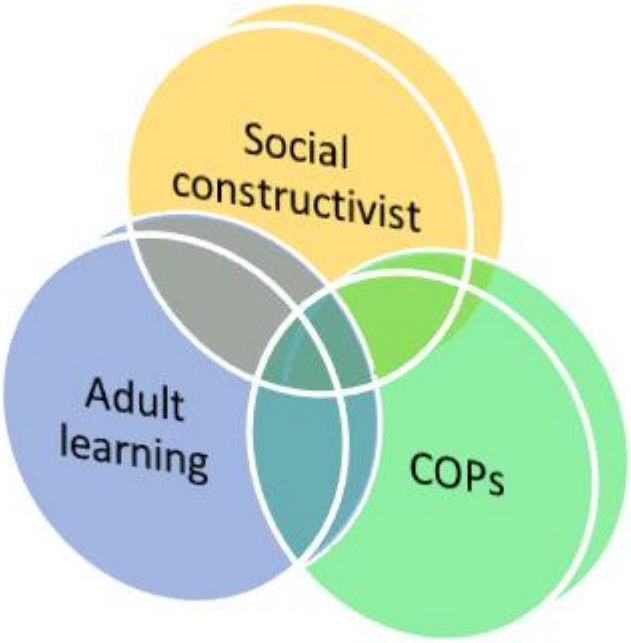

Figure 6 1: Model for future training

These three theories can potentially allow the training designers to encompass the essential components for adult empowerment, namely, a learning process, social environment and experience. The combination of the three theories depicted in the figure is related to the type of sample chosen for this study: the workshops were given to teachers some of whom, in addition to building knowledge, already had some experience in educational technologies. The combination of these theories is suggested for future formations because the constructivism theory encourages lecturers to design learning activities in an authentic context, adult learning theory focuses on the characteristics of adult learners and how they bring in their experiences to guide them along the journey of learning, and community of practice theory allows participants to share understandings concerning what they are doing and what that means in their lives and for their communities. This sharing can be done by faculty members of the same course, and on a broader scale by all faculty members, before, during and after workshops.

The implementation of educational technology is also influenced by the nature of the course and the content of each discipline. It is up to each faculty to use these results to analyze the most relevant factors in their faculty and design strategies to overcome them.

6.8 Recommendations

6.8.1 University management

– Investment in infrastructure is never a waste of money as there are many lecturers and students using educational technology.

– Care needs to be taken not to build facilities with computers that are not used.

– Training of lecturers and support staff should continue.

– Improve the infrastructure that contributes to the university becoming a reference in internet quality

– Promote ongoing training for teachers in the use of educational technologies. The use of educational technologies at UEM should be mandatory and not the choice of the teacher

6.8.2 Staff developers/EdTech designers

– Design different workshops depending on the experience of the participants (beginners, intermediate, advanced).

– A second round of interventions for these participants may mean increased change of practice as now they have basic skills.

– A careful design should always be pursued, but one of the most important aspects to consider is the audience – who is in your class? Even the best plans will not work if participants do not have the baseline knowledge they need.

– Design training for the use of educational technologies based on the nature of the courses offered by UEM. Give greater assistance to teachers with more practical subjects during simulations. Conduct simulations during training that allow the teacher to develop skills in formatting subjects with more practical content. Bring more than one platform to training.

6.8.3 Lecturers

– Investigate innovative methodologies to assist in the teaching and learning process with educational technology resources.

– Look for colleagues in your faculty or course with more expertise in educational technology for help in using the different tools that Moodle provides.

– Actively participate in training on the use of educational technology. Participate in refresher courses as a way to access and master the new technological tools available for the teaching and learning process. Develop the ability to select a technology that you feel most comfortable to teach with.

6.9. Limitations of the study

The major limitation of this study was imposed by COVID 19. At the beginning, the data collection instruments included observation, which, in the researcher's opinion, would allow collecting data that could help support some of the responses of the respondents during the interviews. However, because of the COVID-19 pandemic, face-to-face classes were interrupted and it was not possible to apply this instrument. The second limitation was gathering the sample to carry out the interviews; since the professors worked from home, contact with potential respondents had to be done first by email and many of the professors did not respond to emails and it was decided to contact them by telephone to explain to them the nature and objectives of the study. The third and final limitation was experienced during the interviews, which, because of the pandemic, could only be done by phone call or using an online platform. Here, the challenge was to identify the medium to be used, the way to record the interview and manage the fluctuation of the internet, which sometimes did not allow the interview to go through to the end and forced the researcher to reschedule it.

6.10 Future research

This study was carried out in a period considered atypical due to the COVID-19 pandemic, which limited the search for some data that would have been obtained from observation.

Barriers, such as resistance to change by some teachers can be explored in future research to investigate the reasons why these lecturers resist the use of educational technology.

Further research can consider other aspects, such as the range of access to training for faculty who are in off-campus colleges, different platforms for the different courses that UEM offers, and platforms in which teachers have more interest and ability to manage. This

recommendation arises in the context of the results obtained by this research, where there was a tendency that most teachers who participated in the workshops did not use Moodle even after the pandemic, opting for platforms, such as Zoom, Google Meet, and Google Classroom (Martins et al., 2021; Uacane & Pego, 2021). Future studies could investigate why the preference for one platform over another and how this can influence the massive use of educational technology.

Even having faced some limitations, the results presented here are useful to improve and/or direct future projects to promote the use of educational technology in UEM.

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Appendices

Appendix A: Research instruments

A1. Interview transcription (test)

Interview questions	Transcription	Time
Are you using the technology introduced to you In the Ed Tech program in your classroom?	Yes! Even before Edtech, I used technologies because when I joined UEM I already trained teachers to use excel, power point, but not as educational technologies, but as basic computer tools. But when I went to do the master's degree I started to have a clearer idea of what educational technologies were and when I came back I tried a digital platform in the master's degree still remotely, that's why I was more interested when I received Edtech's proposal.	6 min
How have these new technology practices changed the way you teach?	It is not the technologies that bring about change, teachers and students who must change the teaching philosophy, plan learning activities based on educational technologies and the student to carry out these activities. and most of these activities must take place outside the classroom.	3 min

Looking at the situation we are experiencing because of the coronavirus, in what ways were the workshops on educational technologies a useful learning experience for you?	Yes, they were useful for teachers, it is these teachers who today help other colleagues to work with these technologies. As I said, EMU itself did not understand how these technologies worked and which platforms should be used, with the pandemic, EMU realized that the platforms it already had played a very important role, which is why I say that the workshops helped not only to me but everyone who joined and these in turn have helped many other colleagues to become familiar with these platforms and even the university itself to know where and how to invest when we talk about technologies. The workshops helped to move forward with the teaching process with the emergence of the pandemic.	3min
4.Have you received any requests from your peers or colleagues to assist in the use of different educational technologies?	Yes. If you compare the use of technologies between the faculties you will notice that the Faculty of Education is one of the faculties that uses these technologies continuously and that had an influence on my part because I helped many colleagues in this process	4min

	despite having colleagues who still resist the use of technologies, and I know that other colleagues who have been in the workshops have also helped different colleagues in the use of these technologies.	
What were the challenges you faced when introducing technology into your classroom?	The first challenge is the lack of policies and regulations for the implementation of these technologies, there is no instrument that in some way obliges the teacher to use the technologies in EMU. The pedagogical regulation speaks in a generic way and not in a specific way about the use of technologies, this is one of the challenges that UEM has to overcome in the use of educational technologies. Another challenge is the lack of control, for example, at EMU, anyone enters and uses Wi-Fi and costs are incurred on the university because of the lack of control. The second challenge has to do with the lack of training for teachers and students themselves. Access is another challenge and access, during the	5min

	pandemic, students were unable to access classes because they do not have a laptop and these instruments are like a hoe for a machambeiro, it is not possible to work with technologies without these instruments.	
What feedback have you received from your students regarding the new educational technologies that have been exposed to “classroom”?	We can say that the feedback is positive, apart from complaints about costs and internet fluctuations, or if they do not have a computer or smartphone. What I have noticed is that the acceptance of the use of these technologies varies by age, for the shifts that we have a little older student, we see a reduction in the number when we start to use the technologies actively, but in contrast the younger ones have accepted and positively matched.	5min
Do you Have access to technical support in the use of these technologies and what are your support needs now and potentially in your future use of technology?	Technical assistance is still a problem, I have played this role by calling the computer center, and the computer center itself does not have a robust team to provide technical assistance in time. When we have difficulties, it takes time to have the	3min

	assistance required, which is why I say it is deficient.	
What are the advantages of using educational technologies in the classroom	Technologies have come to show that we can easily control the teaching and learning process. When it comes to evidence, for example, academic managers can enter the platform and see what the teacher has done with students, thus facilitating the fulfillment of what was planned for the discipline.	4min
Based on your experiences can you recommend the use of these educational technologies to other teachers?	The teacher has to stop having a phobia, dedicate a little time and they will discover the wonders that technologies do.	
How do you evaluate the questions?	The conversation was more comprehensive in relation to the use of technologies. We touch on aspects related to policies, tools. It should open up more about the very tools that are being used in UEM. The issues seem to be no longer related to the teaching and learning process as such.	2min
Total	10	35mi

A2. Interview question

RESEARCH PROPOSAL FOR THE MASTER'S DEGREE IN EDUCATIONAL TECHNOLOGIES

IMPROVING THE TEACHING STAFF CAPACITY TO NINTEGRATE EDTECH IN THE TEACHING ANDNLEARNING PROCESSES AT EDUARDO MONDLANE UNIVERSITY

Author: Marisa Jeremias Mate

Semi-structured interview script

This interview is aimed at participants in pilot workshops on educational technologies. Due to the social situation experienced by the new corona virus, this interview will be conducted based on online platforms, such as Skype, Zoom, what sup and telephone contact depending on the availability and resources of each interviewee. Depending on the kind of platform that will be used, this interview will take about 20-30 minutes.

General questions

Age

Gender

Years of work

Interview questions

	EdTech	
Main question	**Research Question**	**Themes and Codes**
How do the skills and practices learnt by lecturers on the EdTech sub-program scaffold and equip them to respond to enablers and barriers to use educational technologies in the teaching and learning processes at UEM?	I.How do lecturers' experience and respond to the EdTech sub-program constructivist strategies intended to encourage and support the use of educational technologies?	Participant selection engagement strategies encourage support different to previous strategies barriers to participation barriers to interaction in workshop what worked well monitoring assistance outside workshop

	Lecturers	
Main Question	**Research question**	**Themes and codes** **Interview questions**
How do the skills and practices learnt by lecturers on the EdTech sub-program scaffold and equip them to respond to enablers and barriers to use educational technologies in the teaching and learning processes at UEM?	**II**. What are the changes lecturers make in their classroom practice based on their own experience and after attending the workshops from the EdTech sub-program?	**1**. Are you using the technology introduced to you in the Ed Tech program in your classroom? Which kind of technologies have you used? **2.** How have these new technology practices changed the way you teach? **3.** Looking at the situation we are experiencing because of the coronavirus, in what ways were the workshops on educational technologies a useful learning experience for you?

		4.Have you received any requests from your peers or colleagues to assist in the use of different educational technologies?
/ :	**III.** What are the enablers and challenges/constraints faced by lecturers using educational technology?	**1**.What were the challenges you faced when introducing technology into your classroom? **2.**What feedback have you received from your students regarding the new educational technologies that have been exposed to “classroom”? **3**.Do you Have access to technical support in the use of these technologies and what are your support needs now and potentially in your future use of technology?

	IV. What are the successful examples of the inclusion of educational technology in the learning and teaching processes and what lessons can be learnt from them?	**1**.What are the advantages of using educational technologies in the classroom? **2**.Based on your experiences, can you recommend the use of these educational technologies to other teachers?

Research Question	who?	Themes and code Theory
Research question	EdTech Staff	Social constructivist
I. What strategies do 'the EdTech project developers adopt to encourage and support lecturers to make use o educational technologies?	EdTech Stuff	social constructivist, workshop design workshop activities encouragement support barriers and difficulties

What are the changes lectures make in their classroom practices after attending the workshops from the EdTech Sub-program	Lecturers	Social constructivist Classroom practices Use of Moodle Changes made by lectures
What are the challenges/constraints faced by lecturers using Educational Technology?	Lecturers	Adult learning Barriers to the use of ET Feedback from students Technical support
What are the examples of the successful inclusion of Educ Educational Technology in the learning and teaching process?	Lecturers	Community of practices Advantages of ET Use of ET at UEM

A3- Example of coding in Excel

Q numb	Question	Alias	Utterance	reference	Interview	code	Tools/platforms	collaboration		Advantages	values coding	Feedback	Barriers/constraints	enablers	Support	Recommendations	count
1	Exp Years	Claudio															
1	MOODLE	Claudio	I was admitted to UEM with basics such as PowerPoint and other ICTs programs. I had never used them before the workshops, I had learned about Moodle in some trainings but I didn't use it. After EdTech I didn't apply Moodle because it was complicated and other colleagues were not familiar with it. I used zoom, google classroom and WhatsApp.	claudio pag 1, 1st colun	1	Didn't use	Zoom, google classroom;whatsapp	weak		Learned about moodle before			complicated and other colleagues were not familiar				
1	MOODLE	Denise	I had never used any technology before, but we were then forced to do so due to the pandemic. Nevertheless, I didn't use Moodle, I used zoom, I intend to use Moodle again, and I also use WhatsApp	Denise pag 1, 2nd colun	1	Didn't use	zoom; whatsapp			have used other platforms			never used any techology before	intend to use moodle			1
1	MOODLE	**Gaby**	I have not used the Moodle platform, I use other platforms now, nevertheless, I used the knowledge I acquired in the trainings to improve my classes especially in this pandemic period. I have been using google classroom for activities and zoom for interaction.	Gaby pag1 3rd colun	1	Didn't use	google classroom; zoom			have used other platforms				using knowledge from trainings to improve classes			1
2	CWT	**Claudio**	They changed because, they replaced direct interaction, we share videos, we go on YouTube and share with the students and we didn't do that before in the face-to-face class approach, we didn't associate the internet with classes	Claudio pag 1-2; 1st colun	2	Has Changed positively the way of teaching		strong		share videos and go on youtube with students				New approach to face-to-face class			1
2	CWT	**Denise**	They did change, nevertheless, these technologies only work for some courses, for medicine it is complicated	Denise pag 1, 2nd colun	2	Has changed but not positively		weak					It is complicated to use these technology for medice courses.				
2	CWT	**Gaby**	Yes, they did, in my class, mainly because it is a morphology class. I use a microscope to look at tissues for example, and due to these platforms I found out that I can use them to show things to the students and show that there are plenty of atlases available, the way you see an organ is different from looking at it using a microscope.	Gaby pag 1-2; 3rd colun	2	Has changed posetively		strong		using platforms to replace microscope				due to these platforms I found out that I can use them to show things to the students and show that there are plenty of atlases available			
5	Chalenges	**Claudio**	Working with teachers who have not yet been trained; Internet problem, the internet is unstable and we often use our own means to continue the classes; Student access to the Internet and technological tools; Teachers' resistance to access the platform;	Claudio pg 2-3; 3rd colun	5	internet; training and tools							lecturers nt trained yet; internt problem; technological tools and lecturers resistence				
5	Chalenges	**Denise**	The complexity of courses and subjects; difficulties the student has in terms of equipment and internet; internet problems; lack of transparency in the tests;	Denise pag 2; 4th colun	5	internet and complexity							complexity of some courses and subjects; equipment for students; internet problems and lack of trasparency.				
5	challenges	**Gaby**	The internet coverage is the biggest challenge, we want to do more, but the internet doesn't help. Other issues we may overcome but the internet doesn't help.	Gaby pag 2; 5th colun	5	internet							the internet coverage doesn't help				
6	Feedback	**Claudio**	It is a mixed feeling, there are two groups, one that adheres to them well and even prefers them, and the other that doesn't, they think they don't understand them well, they can't afford the internet, they don't have compatible devices,	Claudio pag 3; 3rd colun	6	aceptance						positive and negative; there are two groups, one that adheres and other that doesn't acepte					
6	Feedback	**Denise**	The feedback is positive, they take advantage in getting good grades, because I have no way of knowing who is behind the computer	Denise pag 3; 4th colun	6	aceptance			117			posite, they take advantage					
6	Feedback	**Gaby**	The acceptance is positive, except for those who do not have devices compatible with the platforms, but generally the acceptance is positive	Gaby pag 3; 5th colun	6	aceptance						positive, mainly for who have got apropriate devices					
			I can't remember any for now, I														

A4. Teacher Information Sheet

Dear Teacher

A case study in Educational Technology

I, **Marisa Jeremias Mate**, I am taking a researcher Master in the School of Education at the University of Cape Town. I would like to ask your permission to carry out research on Educational Technology in your teaching practices. My research aims with the purpose of investigate to what extent the lectures have used educational technologies based on what they learnt from the EdTech sub-program and their own experiences, and the implications of this use for the teaching and learning processes at UEM. I am convinced that the use of Educational Technology is becoming more and more experienced by teachers, mainly in this time of pandemic.

In this research data collection will be in the form of semi-structured interviews with academics and staff developers. the interviews would be administered online, face to face and by telephone contact to reduce the exposure of the interviewer as well as the interviewees to Covid-19. In order to conserve all information that will be collected the interviews will be recorded with the prior authorization from the interviewee.

Participation is voluntary and the confidentiality of the teachers, is guaranteed. Pseudonyms will be used for all participants in the writing up of the research. You may withdraw permission for conducting the research at any time.

Please fill in the slip in attach to indicate your consent for the research. You are welcome to ask any questions regarding this research by telephone or email to either of me: Marisa Mate on marisamt403@gmail.com or by 840371090

Yours sincerely,

Lic. Marisa Mate

A5- Informed consent form

UNIVERSIDADE
EDUARDO
MONDLANE

FACULTY OF EDUCATION

EDUCATIONAL TECHNOLOGY CASE STUDY INTERVIEW CONSENT FORM

Dear Teacher

You are invited to participate in an interview conducted by Marisa Jeremias Mate, a researcher from Eduardo Mondlane University, Faculty of Education.

This research is aimed at understanding the effect of the EdTech sub-program workshops in which you were a participant. This sub-program is based in the UEM informatics center and is part of the UEM-SWEDEN Cooperation program

With the permission of your faculty, you were invited to participate in a series of workshops about Educational Technologies, where you were encouraged to share a build on your teaching with technology experience and where you were introduced to practices important tools in using these technologies.

Several research on technologies at the UEM has been developed, however there are still few authors who research in the area of educational technologies. The main purpose of this research is to share information about your Educational Technologies practices in the learning and teaching process, including the challenges and enablers that you have faced in this process mainly in this period of the COVID Pandemic.

Data collection will be in the skype, WhatsApp and face to face semi-structured interviews form for about 30 min.

Consenting to participate in this Educational Technology research interview means that you agree to the following:

● The nature and purpose of this interview have been explained to you.

● You will not be identified in the subsequent Master's thesis or any other papers or presentations of this research.

● Personal and research data (including written notes, digital recordings and transcripts) will be stored in a secure location for a period of no less than 5 years.

● The results will be made available to the funders and through academic publications.

● Participants who are interested can also obtain the results via email.

● No potential risks are envisaged and every attempt will be made to confer with case study participants in order to ensure that detail is captured correctly. Interviews are intended as an opportunity for participants to talk about their experiences with the use of Educational Technologies in the classroom and the challenges that they have faced on the effective use of those technologies.

● Participation in the interview research is voluntary, and you may withdraw at any time without any consequences. As a participant, you may also refuse to answer any questions you do not want to answer.

● You may also withdraw your consent at any time. You are not waiving any legal claims, rights or remedies because of your participation in the interview research.

● No form of financial reimbursement is envisaged through this research transaction.

If you have any questions about the research and its research purpose, please contact the principal Investigator dr. Marisa Mate (marisamt403@gmail.com) or coordinator of the EdTech sub-program Luis Neves (luis.neves@uem.mz).

Yours sincerely,

dr. Marisa Jeremias Mate

INFORMED CONSENT

I hereby agree to participate in research regarding "Integrating Educational Technologies to Improve Teaching Staff Development and Learning Processes at UEM". I understand that I am participating freely and without being forced to do so in any way. I also understand that I can stop this interview at any point should I not want to continue and that this decision will not in any way affect me negatively.

I understand that this research project will not benefit me personally.

I have received the contact details of a person to contact should I need to speak about any issues which may arise in this interview.

I understand that, if at all possible, feedback will be given to my faculty on the results of the completed research.

I understand that this interview will be digitally recorded and I hereby agree to the recording of my participation in the study.

Name of case study subject: _____

Signature: _____

Subject contact email address: _____

Date: _____

Name of researcher: _____

Signature: _____

Researcher contact email address: _____

Date: _____

A6. Ethical clearance

SCHOOL OF EDUCATION

Dr. Joanne Hardman
University of Cape Town, Private Bag X3, Rondebosch, 7701
Physical address: Humanities Graduate School Building, University Ave South, Upper Campus Tel: +27 (0) 21 650 3920 Fax: +27 (0) 21 650 3489
E-mail: Joanne.Hardman@uct.ac.za Internet: www.uct.ac.za/depts/edu

EDNREC20210207

25 February 2021

M. Mate
MTXMAR011

RE: Ethical Clearance for Masters Research project

I am pleased to inform you that ethical clearance has been granted by the School of Education Ethics Review Committee of the Faculty of Humanities for your academic project INTEGRATING EDUCATIONAL TECHNOLOGIES TO IMPROVE TEACHING STAFF DEVELOPMENT AND LEARNING PROCESSES AT EDUARDO MONDLANE UNIVERSITY. We wish you all the best with your research.

Regards

ASSOCIATE PROFESSOR JOANNE HARDMAN ETHICS CHAIR

A7- RESEARCH TRAINING PARTNERSHIP PROGRAMME UEM-SIDA

2017-2022

Universidade Eduardo Mondlane

Research Supporting Component Programme

(UHR number 82)

11 April 2017

1. Title

Increased and effective use of ICT for Research, Teaching and Learning enabled and sustained through the modernization of ICT training, support systems and infrastructures:EdTech-UEM

2. Budget

UEM: 23,500,000.00 SEK

RSA: 1,500,000.00 SEK

3. Coordinators names, institutional affiliation and e-mail addresses

Coordinator of the Research Supporting Component Dr Luis Neves Cabral Domingos ICT in Education, Research & Development Unit (TIC-EID) UEM Informatics Centre (CIUEM) Eduardo MondlaneUniversity Av. JuliusNyerere, Campus Universitário	Coordinator of the Research Supporting Component Tony Carr Centre for Innovation in Teaching & Learning (CILT) University of Cape Town Private Bag X3,

C.P.257 Maputo-Mozambique e-mail: luis.neves@uem.mz	Rondebosch 7701 South Africae-mail: tony.carr@uct.ac.za
Director, UEM Informatics Centre Eng Francisco Mabila	

4. MSc and/or PhD program to be developed/established

None. This is a research supporting sub-programme.

5. Short/Cross-cutting courses to be developed

Multiple training workshops for research and teaching staff in all faculties and schools onusingeducational technologiesfor research, teaching and learning.

6. Number of Post-doc's, PhD's and MSc's to be trained and where they will be trained

Courses at UCT, South Africa: 1 PhD, 4 MScs in educational technologies, 2 MScs in ICT technologies, 4 Postgraduate Diplomas in educational technologies.

7. Research objectives and importance for development of Mozambique and poverty reduction

The purpose of the EdTech-UEM project is to enhance the capability of Eduardo Mondlane University to conduct and disseminate high quality research and to teach and supervise the next generation of Mozambican professionals and researchers. Its contribution to improving inclusive and equitable learning opportunities in higher education will promote gender equality and the production of future researchers and professionals working in different socio-economic sectors who will help achieve development and poverty reduction goals.

The main research question for this project is about the design and impact of a model and activities for training lecturers in the use of technology for teaching, learning and research. The results will contribute towards the study and implementation of deeper learning approaches that emphasize critical thinking, problem-solving, collaboration and self-directed learning, all of which are fundamental for a research-led university.

8. Potential innovative approaches (products, processes)

The innovation of this project is in the area of pedagogy: the use of ICT tools to increase multi-directional information flows, and the ongoing integration of new methodologies related to research processes and teaching and learning that will result from the widespread use of educational technologies. These in turn give rise to institutional changes. Although this process is already advanced in other universities, the project represents the first consistent initiative in the area by UEM.

Summary

The purpose of the EdTech-UEM project is to enhance the capability of Eduardo Mondlane University to conduct and disseminate high quality research and to teach and supervise the next generation of Mozambican professionals and researchers. Both of these capabilities are essential to the sustainability and competitiveness of the university. The project is important because it will take the first coordinated steps towards these goals, through the integration of four strategies: 1) the development of a multidisciplinary unit (TIC-EID) for promoting and institutionalizing ICT-based research, teaching and learning at all levels of UEM; 2) the design and introduction of a staff development model to support the integration of educational and collaborative technologies (EdTech) into UEM research, teaching and learning processes; 3) the expansion and modernization of ICT infrastructures, equipment and management systems to enable and support largescale use of ICTs throughout UEM for research, teaching and learning; and 4) growing the capacity of UEM staff to research and improve e-learning and digital scholarship within the institution. Colleagues from the University of Cape Town, mainly based in the Centre for Innovation in Learning and Teaching, will assist UEM with its preliminary studies and planning, design of a staff development model for teaching with technology, the design and piloting of staff development activities, and evaluation and research of the staff development activities. UCT will also provide postgraduate training in Educational Technology and ICT at PhD, Masters and Postgraduate Diploma levels.

Project implementation will result in improved access to information and communication through upgraded UEM infrastructure, management and maintenance systems, at least one-third of research and teaching staff on all campuses enabled to use educational technologies in their work through participation in basic and specialized workshops, a gradual impact on the teaching and learning methodologies in use, the upgrading or installation of a research and learning laboratory in each faculty and campus, initial capacity to design and deliver blended or online courses in different formats, and a nucleus of postgraduates equipped to take educational technology use in UEM forward to the next phase.

Popular science description

Technology is a crucial enabler of research and teaching and learning in higher education. Researchers with access to digital tools, networks and skills are able to compete and collaborate within global research communities. Lecturers with access to versatile and reliable online learning environments and equipped with e-learning skills can become more effective and efficient educators. Students who develop digital skills and citizenship through engagement in blended and online learning will be better equipped as professionals, researchers and leaders in the 21st century.

The main research question for this project is about the design and impact of a model and activities for training lecturers in the use of technology for teaching, learning and research. A variety of formats and ICT tools will be piloted and tested, providing lessons on what works and what does notin the context of UEM. The results will contribute towards the study and implementation of deeper learning approaches that emphasize critical thinking, problem-solving, collaboration and self-directed learning, all of which are fundamental for a research-led university