INVESTIGATING PRE-SERVICE TEACHERS' PREPARATION FOR THE INTEGRATION OF ENVIRONMENTAL AND SUSTAINABILITY EDUCATION KNOWLEDGE, SKILLS AND ATTITUDES INTO THE ESWATINI SCHOOL CURRICULUM

by

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Submitted in fulfilment of the requirements for the degree

DOCTOR OF PHILOSOPHY

in

CURRICULUM AND INSTRUCTIONAL STUDIES

COLLEGE OF EDUCATION

at the

UNIVERSITY OF SOUTH AFRICA

PROMOTER: PROF. A.S. MAWELA

NOVEMBER 2022

RESEARCHER'S DECLARATION

I declare that the study *INVESTIGATING PRE-SERVICE TEACHERS' PREPARATION FOR THE INTEGRATION OF ENVIRONMENTAL AND SUSTAINABILITY EDUCATION KNOWLEDGE, SKILLS AND ATTITUDES INTO THE ESWATINI SCHOOL CURRICULUM* is my own work and that all the sources that I have used or quoted have been indicated and acknowledged by means of complete references. I further declare that I submitted the dissertation to an originality checking software.

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This dissertation was submitted with my approval

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ACKNOWLEDGEMENTS

DEDICATION

This study is dedicated to my wife, Elizabeth Kamugasa Kyamogi and our son,
Jonathan Peter Mwesigwa Kyamogi

ABSTRACT

This study aimed at investigating the extent to which pre-service teachers are being prepared to integrate Environmental and Sustainability Education knowledge, skills, and attitudes into the Eswatini school curriculum. This was done by investigating the levels of pre-service teachers' knowledge on Environmental and Sustainability Education matters as well as the prevalence of pro-environmental attitudes among them. Further, in-depth investigations were carried out to achieve a detailed understanding of Environmental and Sustainability Education realities among pre-service teachers. A mixed methods research approach that involved integrating qualitative and quantitative data collection and analysis, was adopted for the study. A multisite case study type was applied involving two teacher training institutions and two primary schools. Three theories formed the theoretical framework: Constructivist theories of learning which guided the process of lesson observation, Bernstein's concepts of Classification, Framing and Curriculum Recontextualisation and Rogan and Grayson's Theory of Curriculum Implementation which informed the design of analytical tools. Using random sampling, quantitative data from 211 pre-service teachers were collected via a structured questionnaire. Purposive sampling identified 15 participants for interviewing. Qualitative data were collected by conducting document analysis, lesson observations, field observations and observation of practices. The quantitative data were analysed using descriptive statistics as well as the Chi-square inferential data analysis test. Qualitative data from interviews were analysed using content analysis that produced categories and themes. The analysis of course outlines as well as lesson observations was guided by the Bernsteinian-based research tools. The results revealed that teacher training institutions in Eswatini to a minimal extent prepare pre-service teachers for teaching and integrating Environmental and Sustainability Education into their curriculum planning and teaching practices. To improve Environmental and Sustainability Education mediation, a two-phase implementation framework was developed to strengthen the way pre-service teachers are being prepared to integrate Environmental and Sustainability Education knowledge, skills and attitudes into the Eswatini school curriculum.

KEY WORDS: Curriculum Integration, Environmental and Sustainability Education, Environmental and Sustainability Education Mediation, Pre-service Teacher

Education and Training, Sustainability Competencies, Sustainable Development Goals

LIST OF ACRONYMS

APR	Accord Progress Report
AUB	American University in Bulgaria
BU	Bournemouth University
CK	Content Knowledge
COVID-19	Corona Virus Disease of 2019
EE	Environmental Education
EEA	Eswatini Environment Authority
EfS	Education for Sustainability
EMoET	Eswatini Ministry of Education and Training
ENETSP	Eswatini National Education and Training Sector Policy
ESD	Education for Sustainable Development
ESE	Environmental and Sustainability Education
FoE	Faculty of Education
GS	Global Seminar
HE	Higher Education
HEI	Higher Education Institution
HLPFSD	High-level Political Forum on Sustainable Development
HU	Harvard University
HUAS	Hamburg University of Applied Sciences
ICT	Information and Communication Technologies
IK	Indigenous Knowledge
IKS	Indigenous Knowledge Systems
IPCC	Intergovernmental Panel *on* Climate Change
LO	Learning Outcome
LU	Lund University
MESA	Mainstreaming Environment and Sustainability in African Universities
MMR	Mixed Methods Research
NASA	National Aeronautics and Space Administration
NCC	National Curriculum Centre
ODeL	Open Distance e-Learning

ORF	Official Recontextualisation Field
PBL	Project Based Learning
PCK	Pedagogical Content Knowledge
POL	Project Oriented Learning
PRF	Pedagogic Recontextualisation Field
PTD	Primary Teacher's Diploma
PST	Pre-service Teacher
PU	Plymouth University
QDA	Qualitative Data Analysis
RCE	Regional Centres of Excellence
RF	Reproduction Field
RU	Rhodes University
SANU	Southern Africa Nazarene University
SC	Sustainability Competence
SD	Sustainable Development
SDG	Sustainable Development Goal
SE	Sustainability Education
SPSS	Statistical Package for Social Sciences
STD	Secondary Teacher's Diploma
TTC	Teacher Training College
TTI	Teacher Training Institution
UK	United Kingdom
UN	United Nations
UNECE	United Nations Economic Commission for Europe
UNESCO	United Nations Educational, Scientific and Cultural Organization
UNDESD	United Nations Decade of Education for Sustainable Development
UNESWA	University of Eswatini
UNGA	United Nations Global Agenda
UOB	University of Bologna
UNISA	University of South Africa
USA	United States of America
WCED	World Commission on Environment and Development

ZPD	Zone of Proximal Development

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CHAPTER 1: INTRODUCTION TO THE STUDY

'Education has a catalytic impact on the well-being of individuals and the future of our planet.' Bokova Irina, Director-General, UNESCO[1]: 2009-2017 (UNESCO, 2017a).

1.1   INTRODUCTION

This study investigated the extent to which Pre-Service Teachers (PSTs) were being prepared to integrate Environmental and Sustainability Education (ESE) knowledge, skills and attitudes into the Eswatini school curriculum.

This chapter provides the context of the study and gives the overall outline of the dissertation. It begins with the general background to the research: it provides an outline of theoretical foundations to serve as epistemological guides and it clarifies key terms used in the study. The chapter also presents the problem statement and research questions, aims and objectives. It further gives a synopsis of the research methodology and describes the measures taken to ensure trustworthiness and ethical considerations that are deemed to be aligned to the University of South Africa's (UNISA) research and ethical standards. The chapter ends with a presentation of the structure of the dissertation and the chapter summary.

The history of our life-supporting planet Earth that is sometimes referred to by scientists as the 'Blue Marble' in the dark universe, describes a challenging time for all living things in the biosphere (Petsko, 2011:1). The life-supporting planet is experiencing persistent manifestations of a warming climate in different places and at different levels of intensity. Education should, therefore, take centre stage to address issues that directly affect humankind and it is, hence, a call for action to save our planet. The evidence of continuous incremental changes in carbon dioxide levels in the atmosphere, the increase in ocean heat content, and the rising global sea level compel us to rethink what needs to be done and how education can catalytically play a pivotal role in guiding humankind to ensure that the planet earth remains a habitable

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[1] UNESCO – an acronym for United Nations Educational, Scientific, and Cultural Organization – is the United Nations' (UNs') specialized agency for education entrusted to lead and coordinate the UN Education 2030 Global Agenda. It provides global leadership by responding to global challenges through Education Systems of Nations (UNESCO, 2017a).

home, today and in future (Blendis, 2022; McSweeney, 2020; NASA, 2020; UNESCO, 2017a). Everywhere, there are warnings that the life-support systems within the earth's biosphere have become less efficient, mainly because of activities carried out by human beings (Revill & Harris, 2020; The National Academy of Sciences & the Royal Society, 2020; Watts, 2020).

For example, if we consider the past 10 decades, many plant and animal species have become extinct as a result of an increase of about 0.5° C of the average global temperature (Woetzel *et al.,* 2020). This continued global temperature increase has led to more melting of ice around the North and South Poles, resulting in the rise of the sea level, accompanied by extensive flooding of coastal areas (De Beer, Dreyer & Loubser, 2016; IPCC, 2020).

Since humankind inhabits a planet with finite resources, it is essential to organise its social, economic, and political experiences around this fundamental truth. Such a call to promote living more sustainably can best be handled in educational settings (Le Grange, Loubser & Le Roux, 2016). This realisation about our delicate planet should be appreciated and understood by every boy, girl, man and woman. Greta Thunberg, the young Swedish environmental activist, who challenged world leaders, does not want people to be hopeful about climate change. She wants everyone to panic so that we are all jostled into meaningful action (Shellenberger, 2020).

Her point is valid as there is scientific evidence pointing to the fact that the planet is set to face ever-increasing environmental, social, and economic challenges. As such, the role of education to transform humankind and to achieve a transition to a sustainable future by influencing the way we think and act, not only individually, but also as communities, is clearly an appropriate priority (McGrath, 2019). As long ago as 2014, Bokova indicated that fundamental change is required in the way we think about the role education should play in global development (Bokova, 2014).

The shift in our lifestyles and a transformation of the way we think and act, require the impartation of specific knowledge, new skills, and pro-environmental values and attitudes, all of which can and should lead to more sustainable societies. The best way education systems can respond to such a challenge is by putting in place relevant teaching and learning approaches, within which there are specific outcomes to help learners acquire sustainable competencies that can enable them to participate

meaningfully as members of sustainable communities (UNESCO, 2017a). Used as a transformative tool, education can effectively initiate efforts to create such aforementioned communities so that they may be equipped with the responsibility to safeguard our common future as we apply the values, skills, and knowledge of sustainability in our local, national, and international contexts (Bokova, 2014).

Globally, there have been high expectations of formal education contributing to sustainability, especially where Higher Education Institutions (HEIs) are considered as centres of excellence in promoting sustainable development. Courses, policies, and infrastructure have been designed and upgraded in the pursuit of sustainability goals. Therefore, co-ordination and comprehensive networking attainable through educational efforts are mandatory if the goals of such endeavours are to be realised (Lipschutz, De Wit & Lehmann, 2017; Wals, 2012).

Many HEIs have committed themselves to embedding sustainability in their curriculum policies and practices (Junyent, Cebrián & Pubill, 2015). The holistic integration of Environmental and Sustainability Education (ESE) into the curriculum structures of HEIs has, however, remained a huge challenge, and ways in which to do this effectively need investigation (Mohamedbhai, 2012; O'Donoghue, Taylor & Venter, 2018). Yet, the roadmap that the 2030 United Nations Global Agenda (UNGA) provided to achieve sustainable development through Sustainable Development Goals (SDGs) requires transformation at society level (UNESCO, 2017a). Such a realisation can potentially result in abandoning actions, systems, mind-sets, and lifestyle choices that are not pro-environmental and that are responsible for the current state of the biosphere (Andama, 2019). The 2030 UNGA is a global United Nations (UN) initiative to transform the world into a sustainable system (UNESCO, 2017a). It is discussed in more detail in Chapter Two.

The study recognises the need for the global context in order to achieve the UN-backed SDGs and it explores the practices of teacher training institutions (TTIs), specifically the way they are implementing SDG targets 4.7 and 4c[2]. Motivated by the

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[2] **Target 4.7**: Education for Sustainability and Global Citizenship: By 2030 ensure all learners acquire knowledge and skills needed to promote sustainable development including, among others, through education for sustainable development and sustainable lifestyles, human rights, gender equality, promotion of a culture of peace and non-violence, global citizenship, and appreciation of cultural diversity and of culture's contribution to sustainable development.

need to improve the quality of ESE at different curriculum implementation levels, this study attempted to establish the extent to which TTIs in Eswatini prepare PSTs for teaching and integrating ESE into their curriculum planning and teaching practices. The study also investigated how ESE integration is supported by institutional policies and institutional physical structures that are considered key components of effective curriculum practices (UNESCO, 2017b).

The Kingdom of Eswatini Education Policy explicitly recognises the value of ESE as a medium through which lasting sustainability practices can be realised (Eswatini Government, 2018). Quality education is required to help all humankind change the way we think and act, as we confront sustainability issues so that we may address present and future global challenges. The globalised landscape of learning challenges the traditional approaches to education and training and questions the traditional methods that teachers use to transmit entities of knowledge and information. Such traditional methods are considered to promote passive knowledge reception that often hampers active critical thinking, despite appearing to produce better academic results (Didham, 2018; UNESCO, 2017a; Valbona & Mimoza, 2017).

The aim of the Eswatini Ministry of Education and Training (EMoET) is to prepare and equip learners with skills, knowledge, values, and attitudes so that they may become active participants in economic and social development. To that effect, there has been a reform of the general education system to a competence-based approach, aimed at addressing the need to align the acquired skills with the contemporary labour market demands. General education refers to the level of education before tertiary and comprises early childhood education, as well as the primary and secondary education phases (Eswatini Government, 2018). Embedded in the overall goal of general education is the intention 'to develop individuals for the realisation of a knowledge-based society which contributes to accelerated socio-economic growth with environmental sustainability while instilling responsible citizenship and maintaining moral and cultural values' (Eswatini Government, 2018:5).

The need for education reforms to introduce new skills, values, and attitudes, all underpinned by knowledge to create societies that value sustainability, is greater now

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Target 4c: By 2030, substantially increase the supply of qualified teachers, including through international cooperation for teacher training in developing countries, especially least-developed countries and small Island developing states.

than at any other time, because such reforms introduce into society the valuable skills that can be applied to confront environmental issues, which are manifested in social, economic, and equity dimensions (Didham, 2018; Rosenberg, Ramsarup, Gumede & Lotz-Sisitka, 2016). It is, therefore, of the utmost importance that we make sure that PSTs are properly prepared and that the curricula at the TTIs are suitable to empower them to achieve this in their teaching. Consequently, learners should benefit from this so that they may realise what the environmental challenges are and so that they may be willing and able to change their lifestyles to become more sustainable. To give some understanding of the reason for conducting this research, the next section focuses on the rationale supporting the study.

1.1.1 The Rationale

Reflecting on my whole ESE experience, I realise that nature has always been a fascination in my life. As a five-year-old boy, I had many preconceived ideas embedded in my mind because of many phenomena that I observed occurring in the atmosphere around me. I, for example, thought that rain was formed when smoke that accumulated from bush fires on hill surfaces rose into the sky to become rain clouds. I associated extensive burning of grass with rain formation because this practice occurred during the long dry spells when the grass dried up and the local farmers set it on fire in preparation for the early rains. My childhood home was located about 400 metres from the foot of an evergreen tropical hill which in my mental faculties, presented a majestic display of natural beauty – grassy woodland formations painted in different shades of green representing the diverse tropical flora that appeared as a green carpet all year round.

Later, I completed my secondary and high school education at a school located on a flat hilltop, where the majestic Lake Victoria, a fresh-water lake shared by three East African nations, could be seen – so large and imposing. In that school, the founding missionaries had planted many trees, the modal species being the Eucalyptus tree. The valleys that surrounded this hill were again composed of natural vegetation in many different shades of green.

As a young adult, I would take daily evening walks alone, as the tropical sun would be setting – just to quietly admire the natural vegetation that 'spoke to me'. Yet, in all those years I have just mentioned, I do not recall situations, where, in my primary

school learning experiences, there was any form of explicit teaching about or for the environment using the very natural sceneries that I admired. There probably were other children whose love for the environment rarely intersected with their curriculum experiences at school. The secondary and high school curriculum programmes were both dominated by communicating information that would prepare me for external examinations. These childhood experiences outside the school system, which were indelibly printed on my mind, laid the foundation on which my current interest in environmental and sustainability education (ESE) rests. That interest can be further traced in my professional practices as a high-school science teacher and, later, as a lecturer at a teacher training institution (TTI).

Because of my love for infusing environmental issues into students' curriculum spaces, I established an environmental club at my very first school as a graduate biology teacher. Later on, I moved to the-then kingdom of Swaziland, now known as Eswatini, and the natural beauty in its different formations caught my attention – the typical African bush country of thorny trees, grassland, and savannah forest spreading out over four geographical backgrounds identified as the mountainous High Veld, the subtropical Middle Veld, the Low Veld, and the mountain ridge that runs along the eastern border of the country (Eswatini Government, 2019a). As a high school teacher based in Eswatini, I once again engaged learners in extra-curricular activities, often preferring to supervise projects linked to the environment. This gave me inner satisfaction, even though I regularly observed that many learners struggled to connect environmental project work with their timetabled academic work.

Moreover, as a lecturer at a TTI, as I participated in curriculum practices, I found myself dissatisfied by the lecture memorisation and regurgitation approaches that dominated pedagogical practices whenever I tackled topics linked to ESE. The biology content topic, 'Man and His Environment', was always taught indoors, inside the laboratory, with no form of assessment that was guided by practical experience in the form of projects or research-based tasks. I struggled to reconcile the knowledge-sharing approaches that were being applied within existing literature with how best PSTs should be prepared to apply ESE in their teaching so that it leads to the development of pro-environmental values and attitudes that result in the development of sustainability competencies that are required to tackle environmental challenges. As the 2030 UNGA was being proclaimed, I further questioned my TTI's

commitment to attaining the SDGs, as well as the institution's abilities as a potential goalkeeper for SDGs, to those who could perceive my institution as a change agent (UNESCO, 2017a).

My position as a Science Education lecturer in the TTI qualified me to be a member of the National Science Panel that is directed by the National Curriculum Centre (NCC), the EMoET curriculum organ. As a science panel member, I have had opportunities to participate in national curriculum activities, primarily at the level of curriculum development and implementation, which includes developing curriculum documents in the form of science textbooks and science syllabi. Additionally, at the TTI where I serve, I have participated in developing curriculum programmes and curriculum material for Science and Science Education. I also participated in the introduction of the MESA (Mainstreaming Environment and Sustainability in African Universities) concept to the Southern Africa Nazarene University (SANU) Faculty of Education (FoE) in an attempt to support curriculum efforts on the integration of ESE into the faculty curriculum programmes for all departments. These curriculum professional engagements at national and institutional levels activated my interest in undertaking a research study to establish how Environmental Education (EE) was integrated into the Grade Seven Science Curriculum in Eswatini (Kyamogi, 2017).

In that study, I found that the EE curriculum practices in the Eswatini context were characterised by compromising the effect of the environmental and sustainability education (ESE) because it used normative teaching traditions, which, more often than not, lacked the recommended emphasis of teaching styles that lead to behavioural modification (Kyamogi, 2017). As Sund and Lysgaard (2013) emphasise, education for the environment and sustainability requires knowledge-acquisition approaches that support independent thinking that is formative in nature and that involves practical experiences (Sund & Lysgaard, 2013).

The research findings from the study undertaken for my master's degree, further revealed that the integration of environmental education (EE) was present to a reasonable extent in the Grade Seven Science Lessons and the science curriculum documents produced by the NCC (Kyamogi, 2017). There was, however, a lack of understanding on how, in general, environmental learning efforts were being promoted and supported in the TTIs. The training of in-service teachers, as well as

what was done for PSTs, to ensure that they were adequately prepared to handle EE was not explicitly explored. It was difficult finding information in that regard. I could see the need to understand further how, in Eswatini, TTIs prepare PSTs for teaching and integrating environmental and sustainability education (ESE) into their curriculum planning and teaching practices. The lack of clarity on ESE integration in TTIs has been highlighted in some of the studied literature presented in Chapter Two. Ultimately, one of the findings in the research study on the integration of EE in Eswatini Curriculum Practices, was the need to review the preparation and mentoring of PSTs to ensure that EE training is protracted and relevant. This finding became a viable research seed that has now been sown in this study (Kyamogi, 2017). It is vital to acknowledge the significance of this study, which is presented in the following sub-section.

1.1.2 Significance of this Study

The study was conducted to investigate the extent to which PSTs were being prepared to integrate ESE knowledge, skills and attitudes into the Eswatini school curriculum. There is limited information on how ESE issues are currently integrated in the teacher education curriculum practices in Eswatini when PSTs are being prepared for their field of work. The data generated therefore, could be of great significance at a time when, in spite of the ongoing 2030 UNGA activities, there appears to be persistent misconceptions about what sustainability is and how sustainable lifestyles can be introduced in society (UNESCO, 2017a).

The study may be of great value in that it provides information and clarity concerning the alignment between what PSTs claim to know and what they practise as individuals and as educators. The data generated have the potential to influence policy and practice decisions at national and institutional levels on existing curriculum practices carried out in TTIs in support of values, embedded in the national constitution, that indicate government's commitment to supporting an education system which is pro-environmental. The TTIs in Eswatini are set to benefit as ESE practices are introduced and up-scaled in higher-education institutional-curriculum practices. In the end, more meaningful and productive ESE learning opportunities for PSTs could be created to translate into their later teaching experiences (Eswatini Government, 2005;

Eswatini Government, 2013). To lay a firm foundation for the research, the background of the study is discussed below.

1.2   BACKGROUND TO THE RESEARCH

As stated above, education is highlighted as having a huge impact on matters linked to the environment and sustainability. The major education-related concepts shaping this study are identified as the quality of education in the TTIs in relation to ESE curriculum practices among PSTs. The evaluation of the extent to which TTIs in Eswatini prepare PSTs for teaching and integrating ESE into their curriculum planning and teaching practices, forms the major impetus of this study.

Globally, the quality of education in relation to ESE infusion is gradually gaining a place in the official curriculum documents – notably the syllabi and prescribed textbooks in subjects such as Science and Social Studies (UNESCO, 2018b). This place is in synchronisation with the educational response that is envisaged in the 2030 UNGA as part of the UN SDG 4, where education is presented as a pathway for attaining all the 17 SDGs. Both learners and educators are transformed and empowered to play the role of sustainability change makers and agents. They are both empowered with knowledge, skills, values, and attitudes to contribute to the realisation of a just society that is not only economically viable, but also one that respects environmental integrity (UNESCO, 2017a).

The study investigated educational realities about ESE in TTIs in Eswatini and is well aware that, globally, there is a sustained call to integrate ESE in teacher-education curriculum practices by blending environmental narratives, individual actions, and social experiences that positively influence pro-environmental behaviour (World Bank, 2018). Within this blending that could be present in Eswatini society, the intersecting contributions of cultural values and people's views in a variety of contextual settings are utilised to realise meaningful ESE-based teaching and learning experiences (Lotz-Sisitka & Hlengwa, 2015). HEIs will be able to exchange knowledge that is usually mediated by teaching, research, and community service. As such, they are positioned as vital organs in systems that promote sustainability in appropriate contextual settings (Vilalta, Betts & Gómez, 2016). This is the reason why I consider HEIs to be fertile

research ground, from which data can be generated to enrich the ESE voice that may permeate the Eswatini curriculum discourse today.

Stern, Powel and Hill (2014) explain that effective ESE practices include onsite, active, and experiential learning that is investigative as well as grounded in real-world natural settings that are capable of linking living and learning by associating learning programmes to students' home contexts. In their research, they found cases of teaching and learning approaches that promoted student-centred teaching and learning aimed at providing them with a holistic experience. Such students investigate real-world environmental issues using multidisciplinary approaches to communicate multiple realities in educational contexts.

The findings by Stern, Powel and Hill (2014), central to this study, show that ESE programmes in educational settings, which are similar to those in Eswatini, can lead to positive changes in learning spaces of PSTs by influencing their knowledge, awareness, skills, attention, intentions, and behaviour. Creating such transformative learning experiences for students in Eswatini is possible, and it requires courage, creativity, and a caring attitude (Johnston, 2009). This study has, therefore, the potential to promote transformative learning, as prevailing curriculum spaces are challenged, and learners' foci are redirected to align their ESE curriculum experiences with prescribed global approaches to ESE mediation. The key focus is on learning for a sustainable future that seeks students' understanding of contexts, concepts, and practices that relate to sustainability (Lotz-Sisitka, 2013). In the Kingdom of ESwatini, environmental issues are reported as multi-faceted engagements that are integral to social and economic development. The nation, as part of the global community, needs to respond meaningfully to the environmental challenges caused by human activity.

According to Anderson and Tremblay (2020), Jane Goodall (a renowned primatologist and anthropologist) laments that the most intellectual creature, homo sapiens, is destroying its only known home in the universe. Eswatini has constantly relied on education to realise change, and her educational policies have attempted to pay attention to sustainability challenges. There remains a need, however, for clarity on how to implement ESE programmes locally. The entire education system needs to have, at its core, the sustainability principles of both the intergenerational and intragenerational equity, fairness, and partiality, because ESE is a global

conversation engaging different agents attempting to tackle a construct with a broad thematic structure (Anderson & Tremblay, 2020).

The 2019 Eswatini strategic roadmap indicates that the implementation and the policy coherence on key national priorities are some areas of improvement that need to be addressed by the Eswatini government in order to guarantee a type of economic development that results in improving the quality of life of Emaswati – the Swazi people. It is the responsibility of the EMoET to translate proposed educational plans into tangible results that positively impact people's lives. It is only when such responsibility is clearly assumed that the nation can realise not only the SDGs to which she is committed, but also other educational commitments, such as the Continental Education Strategy for Africa and the Southern Africa Development Community Protocol on Education (Eswatini Government, 2019b).

This study focused on Teacher Education, the main aim of which was the further professionalism of the teaching career, both for initial preparation of teachers at pre-service level and for continuing personal professional development for those in the field, referred to as in-service teachers. In Eswatini, Teacher Education is provided at universities and teacher training colleges. In both cases, the government sets curriculum standards and guidelines for their personal professional development (Eswatini Government, 2019b).

ESE, a construct about people and their planet, echoes in the Eswatini print media, which suggest that it is a researchable entity and that the findings of this study offer much benefit for the Emaswati. The Eswatini head of state, His Majesty King Mswati III, noted that environmental issues were taking a lead in the global arena and challenged the whole nation to apply proactive approaches to support efforts to mitigate the adverse effects of climate change. These effects that were experienced in the form of unusually heavy rains affected many Emaswati, and it is in such contexts that this study seeks to promote ESE learning construction sites. The King further called for a more visible show of commitment to the 2030 UNGA, having endorsed the adoption of favourable national legislation to promote strategies that should accelerate the pace towards achieving the National Agenda – Vision 2022, the 2030 UNGA, and Africa's Agenda 2063. This study, therefore, sought to establish how national frameworks, policies, and implementation strategies are linked to

education and whether such links promote ESE (Didham, 2018; Nene, 2019; Nhlabatsi, 2019; Nkambule, 2019).

Emaswati have shown their support for the King's initiatives to promote SDGs, as was demonstrated by their keen participation in the Earth Hour 2019 – a time which was globally set aside to raise awareness on climate change and its effects. On that occasion, Government, represented by the Minister of Tourism and Environmental Affairs, urged the nation to turn the energy-saving concept into a lifestyle reality potentially capable of resulting in efficient energy utilisation (Earth Hour, 2019).

I therefore chose to do research on curriculum implementation to be able to determine the extent to which TTIs in Eswatini prepare PSTs for teaching and integrating ESE into their curriculum planning and teaching practices. This is a well-timed undertaking, because the African continent has ambitiously launched two agendas that need input from research findings in all areas of life, including education. This study is, in part, about contextualising the attainment of SDGs to make available comprehensive data that will inform agents of policy designers, at all levels of society, to drive curriculum innovation and to transform teacher education towards sustainability in line with the global goals for Sustainable Development (UNESCO, 2017a; 2017b).

It was against this background that I sought to discover the extent to which PSTs were being prepared to integrate ESE knowledge, skills and attitudes into the Eswatini school curriculum. The concept of sustainability and the educational approach, referred to as Education for Sustainability (EfS), are both contested, especially in the areas of implementation in the formal education system, and this implies that establishing ESE in educational institutions is potentially a formidable task (Dreyer & Loubser, 2016).

The Kingdom of Eswatini is a lower, middle-income, landlocked, developing country located in Southern Africa, bordered by Mozambique and South Africa. General education and training in Eswatini begin at pre-school and progress to primary, junior, secondary, and high school, after which there is the tertiary level, where a variety of disciplines are offered, including pre-service teacher (PST) training. University education is offered at the following institutions: University of Eswatini (UNESWA), Southern African Nazarene University (SANU), Eswatini Medical Christian University and Limkokwing University of Creative Technology. As part of Eswatini's strategy to

expand higher education (HE), more private universities and colleges have been officially registered by government to train PSTs; one such university is Amadi University College. Before the establishment of SANU, the former Nazarene Teacher Training College (TTC), which is now the SANU FoE, offered the same academic programmes as the ones offered by the two national TTCs – Ngwane TTC and William Pitcher TTC. (Eswatini Government, 2013; Eswatini Government, 2019a).

Exploring the curriculum quality and the curriculum intention to determine whether the curriculum taught to PSTs was effective and whether it impacted on what they practise, is the main accomplishment that this study could realise. The relevance of ESE in formal curricula is a theme on which many authors report in the sustainability debate. Hence, this study sought to investigate the Eswatini curriculum policy positions to see how they align with curriculum practices, which are investigated during lesson observations, so as to establish whether transformative teaching and learning are practised in TTIs for, and by PSTs. I, therefore, hope to influence positively the TTI curriculum programmes by recommending up-to-date ESE content and by recommending changes that come from the research. Every study needs a framework based on theory and an overview of the theoretical framework which underpinned this research is discussed below.

1.3   THEORETICAL FRAMEWORK

A theoretical framework of a research study is a design plan for the entire research effort and consists of one or more interrelated theories used by the researcher to justify preferred research undertakings carried out to answer the research question (McMillan & Schumacher, 2014). It, thus, explains the path of a research exercise, grounding it firmly in theoretical constructs (Adom, Hussein & Agyem, 2018). The framework, therefore, serves as the foundation upon which the research effort to construct new knowledge rests because it provides guidelines on which the rationale for the study, the problem statement, the purpose, the significance, and the research questions are based. Additionally, it provides a grounding base for the literature review and a functional reference point when research findings are analysed (Grant & Osanloo, 2014). The theoretical framework applied in this mixed-methods study offers the foundation for establishing the credibility of the research findings, thereby making the findings more meaningful and acceptable to a wider audience (Adom *et al.,* 2018;

Gray, 2017). This study, which was aimed at providing an account of the extent to which PSTs were being prepared to integrate ESE knowledge, skills and attitudes into the Eswatini school curriculum is based on three theories.

The first theory is the interpretivist analysis approach based on Bernstein's Concepts of Classification, Framing, and Curriculum Re-contextualisation. Analytical tools based on Bernstein's three concepts were developed to analyse the official teacher education institutional curriculum documents, the subject course outlines, the student modules and notes, the pre-service teacher activities, and the practices in the lecture rooms and teaching classrooms respectively (Nsubuga, 2011). The Bernstein Concept of Framing specifically guided the analysis to understand the curriculum dynamics on knowledge selection, organisation, transmission, and utilisation. Bernstein's Concept of Curriculum Re-contextualisation guided the approach of examining how ESE is mediated among PSTs, as well as their interpretation of Sustainability Pedagogical Content Knowledge in educational contexts (Bernstein, 1990).

The second theory is based on the constructivist theories of learning, which were used since the recommended approaches for mediation on ESE are best supported in natural settings that promote the construction of knowledge through the personal interaction between the learners and their pedagogic spaces (Woolfolk, 2016). The construction of knowledge by individuals, based on experience in an authentic natural setting is the backbone to teach about, in, and for the environment, and, therefore, constructivist teaching strategies in ESE mediation and the attainment of SDGs in educational contexts have significant effects, especially in promoting the contextualisation of teaching material that relates to both the cognitive and the social aspects of a learner. The pragmatic approach applied in this study, therefore, sought to establish whether or not constructivist learning environments exist for the effective mediation of ESE through strategies that promote individual, as well as group knowledge construction (Amineh & Davatgari, 2015; Woolfolk, 2016).

The third theory, the Rogan and Grayson's Theory of Curriculum Implementation, was adapted for ESE and it guided the analysis of the physical conditions, where teacher education is mediated: in the TTIs and in the schools where the PSTs conduct their teaching practice (Rogan & Grayson, 2003).

The just mentioned theoretical framework provides a firm and supportive basis to the way of understanding and planning how to research the extent to which TTIs in Eswatini prepare PSTs for teaching and integrating ESE into their curriculum planning and teaching practices. The framework just described is essential in interpreting the research findings of this study, especially because the analytical tools to help with generating qualitative data have been developed and guided by these theories. By adapting and improving existing analytical tools, this study makes a methodical contribution of the theoretically influenced research tools (Lotz-Sisitka, 2008).

1.4   KEY CONCEPTS

This section clarifies some of the terminology used in this dissertation. The key terms, which have been used in this dissertation, with specific designation and recognition, have been used elsewhere in other research papers. In this study, special attention has been given to their connection with the title and the research question, because their definitions and interconnections are integral to this study and have helped to shape the way ESE implementation in teacher training curricula and its application in teaching has been investigated.

1.4.1 Basic Concepts

In this section, basic concepts relating to environmental education as discussed.

1.4.1.1   Environmental and sustainability education (ESE)

ESE is a hybrid collective name derived from multi-disciplinary fields that include EE, Education for Sustainable Development (ESD), and Sustainability Education (SE). ESE refers to a transformative learning process that is educational in nature and involves the explanation of environmental and developmental concepts to help people develop the capacity to live sustainably in, and for, the environment. ESE is, thus, a trans-disciplinary approach that seeks to address knowledge, skills, and the development of values and attitudes involving the integration of social, economic, and environmental factors (Blewitt, 2010; Cloud, 2016; Kopnina, 2012; Scott, 2014).

1.4.1.2 Curriculum integration

Curriculum integration is a planned and guided attempt to represent the expressions of what should be practised where learning experiences are thematically introduced into different subjects, constituting a curriculum programme. Such knowledge infusion, consisting of relevant content material, results in the implementation of cross-curricular pedagogical content knowledge (PCK) relating to a central core theme, such as SE. In the integration process, the boundaries between subjects are blurred, as the interconnections characterised by common concepts, values, and skills become clearer (Bernstein, 1990; Carl, 2010; Huiying, 2005).

1.4.1.3 Pre-service teacher education and training

Pre-service teacher education and training refers to a period of guided, supervised teaching of student teachers training to become professional teachers through acquiring content knowledge (CK) and teaching skills before they join the work force as qualified in-service teachers. Policies, procedures, and provisions are utilised to mentor the PSTs gradually into the role of teachers, and educational programmes are used to help develop competencies and skills required in teaching, a process that is mostly carried out in TTIs. At the heart of such pre-service teacher preparation is the intention to develop in them multi-dimensional attitudes that have a bearing on the social, political, and cultural settings of the individuals being prepared (Hridaykant, 2017; Jamwal, 2013; Qablan, 2018; Singh, 2012).

1.4.2 Related Concepts

In this section, concepts relate to SDGs, sustainability competencies and ESE mediation are discussed.

1.4.2.1 Sustainable development goals (SDGs)

SDGs are contained in a UNESCO-backed global framework that is part of an ambitious and universal agenda to transform the world into one that is sustainable. It is an initiative attempting to channel human endeavours to focus on improving the standard and quality of human life today, without compromising the ability of future generations to meet their own needs. The 2030 UNGA, consisting of 17 goals and 169 targets, aims at securing a sustainable, peaceful, prosperous, and equitable life for both current and future inhabitants of planet Earth. The goals are, thus, a set of people-

centred, transformative outcomes emerging as both ambitions and challenges to comprehensively confront the social problems of poverty, health education, and gender, among others (Osborn, Cutter & Ullah, 2015; UNESCO, 2017a; 2018).

1.4.2.2 Sustainability competencies

Sustainability competencies are attributes with cognitive, affective, volitional, and motivational dimensions that individuals need in order to live sustainably. They are developed through intentional engagements and actions, combining individual knowledge, capacities and skills, motives, and affective dispositions. Higher-order sustainability competencies, such as critical thinking, collaboration, and integrated problem solving, among others, are necessary for carrying out more challenging actions in specific contexts (UNESCO, 2015; 2017a).

1.4.2.3 ESE mediation

ESE mediation refers to communicating information to develop understanding of environmental and sustainability issues. This can take place by using different forms of mediatory processes, such as teaching and lecturing aimed at encouraging the development of initiative, reflection, and responsibility in learners (Loubser, 2011; Mandikonza & Lotz-Sisitka, 2016).

1.5   PROBLEM STATEMENT AND RESEARCH QUESTIONS

Meaningful integration of issues relating to sustainability and the environment should have a local bearing with a global focus, given the fact that the education system in Eswatini recognises the value of ESE in the 2030 UNGA. There is an opportunity, through the research findings, to inform key aspects of ESE mediation in the aligning of policy programmes and practices, so that meaningful educational policy implementation can be realised in the training of PSTs in HEIs (Maluleke, 2015).

The need to deal with ESE as an approach to teaching and learning, rather than just as PCK to be shared, is greater now than ever before, as traditional approaches to teacher preparation are challenged. Some of the literature covered in this study and presented in detail in Chapter Two, exposes disconnections between what is prescribed and what happens in the classroom. ESE teacher education needs to evolve, especially in the areas of teacher preparation, so that teachers are able to

clearly understand their important roles to support humankind through education (Pedretti & Nazir, 2014; World Bank, 2018).

Aspects of teacher preparation to engage meaningfully in ESE matters in Eswatini have not been adequately explained in existing literature. Documented information detailing the extent to which PSTs in Eswatini have been prepared at TTIs to teach and integrate ESE into their curriculum planning and teaching practices, are not available. Establishing the extent to which ESE issues are integrated into the teacher education curriculum practices at TTIs preparing PSTs for teaching is what the study identified as the main problem.

1.5.1 The Main Research Question

Therefore, the main research question of the study is: *To what extent are pre-service teachers being prepared to integrate Environmental and Sustainability Education knowledge, skills, and attitudes into the Eswatini school curriculum?*

1.5.2 The Research Sub-Questions

The following sub-questions need to be addressed to fully explore the main research question:

1. What does scholarly literature say regarding pre-service teacher training in Environmental and Sustainability Education knowledge, skills, and attitudes in the school curriculum in Eswatini?
2. To what extent are targets 4.7 and 4c of the Sustainable Development Goal 4 integrated into the Teacher Training Institutions curriculum?
3. How is Environmental and Sustainability Education mediated in teacher training institutions during the training of pre-service teachers?
4. What are the factors at teacher training institutions that enhance and/or hinder the integration of Environmental and Sustainability Education knowledge, skills, and attitudes during pre-service teachers' training?
5. How do pre-service teachers integrate Environmental and Sustainability Education into their curriculum planning and lesson presentation in the classroom during teaching practice?

6. What framework could be employed by teacher training institutions to enhance Environmental and Sustainability Education knowledge, skills, and attitudes in the school curriculum in Eswatini?

1.6   AIM AND OBJECTIVES

The study aimed at investigating pre-service teachers' preparation to integrate Environmental and Sustainability Education knowledge, skills, and attitudes into the Eswatini school curriculum.

Therefore, the objectives of the study are:

1. To establish what scholarly literature says regarding pre-service teacher training in Environmental and Sustainability Education knowledge, skills, and attitudes in the school curriculum in Eswatini.
2. To evaluate the extent to which targets 4.7 and 4c of Sustainable Development Goal 4 are integrated into the teacher training institutions' curriculum.
3. To explore how Environmental and Sustainability Education is mediated in teacher training institutions during the training of pre-service teachers.
4. To identify the underlying factors enhancing or hindering the integration of Environmental and Sustainability Education during pre-service teacher training at teacher training institutions.
5. To assess how pre-service teachers integrate Environmental and Sustainability Education in their curriculum implementation practices in the classroom.
6. To propose a framework which could be employed by teacher training institutions to enhance Environmental and Sustainability Education knowledge, skills, and attitudes in the school curriculum in Eswatini.

1.7   RESEARCH METHODOLOGY

Research methodology, according to Rajasekar, Philominathan and Chinnathambi (2013), refers to research procedures that reveal the manner in which to address the research problem; that is, the procedures in describing, explaining, and predicting phenomena, thereby offering the systematic theoretical underpinning so that the logic of the development of the best practices within which such research is conducted may be understood (Gray, Grove & Sutherland, 2017; Igwenagu, 2016).

In the following section, the research methodology for this study is explained.

1.7.1 Research Design

A research design is a collective narrative of the procedures for carrying out a research study. The design is a working plan in which respondents and participants' roles are clearly defined. In the design, the methods used to address the research question are outlined (Leavy, 2017; McMillan & Schumacher, 2014).

1.7.1.1 Research Paradigm

The purpose of a research paradigm is twofold: not only does it position the attitude and relation of a researcher to data collection, but it also positions the researcher in instrumentation selection and data collection methods. Data must be collected in a manner suitable to viewing one's research material (Adams, 2014). Pragmatism is the guiding paradigm in this study. Jensen (2012) points out that pragmatism guides mixed methods research (MMR) and Kalolo (2015) further explains that pragmatism is a practical action-oriented approach applied to find solutions for existing problems and issues – an approach that deals with realities based on practical, rather than theoretical, considerations. Pragmatism, he adds, helps in understanding debates and discourses presented in social reality, as either single or multiple realities, and it focuses on the key research problem, using whatever research methods that are available to solve the research problem. Truth is considered tentative by pragmatists and is established by considering many aspects of what is being researched and applying what works. This study aimed at solving the research problem regarding the extent to which TTIs in Eswatini prepare PSTs for teaching and integrating ESE into their curriculum planning and teaching practices. This means it investigated single realities linked to PSTs, and it also explored multiple matters that relate to ESE integration, ESE mediation, and curriculum practices in ESE.

1.7.1.2 Research Approach

This study used a MMR design that involves integrating qualitative and quantitative data collection and analysis. The central premise of MMR as a methodology is the combined use of qualitative and quantitative approaches to collect additional, complementary, corroborative, or supporting data, thereby strengthening the reliability of findings, because the strengths from one research approach can offset

methodological shortcomings of the other (Creswell & Clark, 2018; Creswell & Creswell, 2018). A mixed methods design was the choice for this study, because one data source would not be sufficient to explain the extent to which TTIs in Eswatini prepare PSTs for teaching and integrating ESE into their curriculum planning and teaching practices. The mixed methods design made it possible, not only to engage a large number of respondents (211 students) to provide a general understanding, but also to deal with the carefully selected set of 15 participants with whom in-depth investigations were able to achieve a detailed understanding of ESE related issues.

This preferred research design was used in this study in order to get information on PSTs' levels of ESE knowledge and to establish the presence or absence of pro-environmental attitudes from a range of respondents by surveying 211 student teachers. This research design also attempted to verify, validate, and enrich the quantitative data with qualitative data collected during in-depth face-to-face interviews with 15 carefully selected participants, as well as curriculum document analysis and field observations of the built, physical structures, the grounds, and their surrounding areas, as well as lesson teaching observations of four PSTs (Gunasekare, 2015; McKim, 2014).

The mixed methods design used in this study is what McMillan, Schumacher and Hearn (2014) refer to as a concurrent triangulation design, also known as a convergent parallel or integrative design (Leavy, 2017). This means that both qualitative and quantitative data are separately collected in the same time frame, with both approaches apportioned equal priority; this is a type of mixed method study that is notated as 'QUAL + QUAN' (Leavy, 2017:174). As indicated above, although collected data was analysed separately, the results were interpreted together to provide a better understanding of the extent to which TTIs in Eswatini prepare PSTs for teaching and integrating ESE into their curriculum planning and teaching practices.

1.7.1.3 Research Type

In this study, a multisite-case study type was applied. Four cases involving two TTIs and two primary schools were investigated to collect data using both qualitative and quantitative research approaches. McMillan and Schumacher (2014) explain that cases can be studied in both quantitative and qualitative research approaches. This study was an instrumental multisite case study that applied triangulated mixed

methods to focus on an in-depth understanding of the extent to which TTIs in Eswatini prepare PSTs for teaching and integrating ESE into their curriculum planning and teaching practices. The case study type was chosen because through it, narrative discourse during interviews was used to get valuable data of the participants' lived experiences (Creswell & Creswell, 2018; McMillan & Schumacher, 2014). Each case served as a unit of analysis, by which replication in data collection enabled me to confirm constructs that emerged, since complementary aspects of the study were combined to help answer the research question. The four cases were purposively chosen, as explained in detail in Chapter Four.

1.7.2 Research Methods

The research methods, defined as the procedures to be used to collect and analyse data, were carried out in line with case study guidelines. The procedures included the selection of participants and respondents, data collection, and data analysis (Cohen, Manion, & Morrison, 2018; Gray *et al.,* 2017; McMillan & Schumacher, 2014).

1.7.2.1 Selection of respondents and participants

Quantitative data were collected from PSTs who were in years one, two, and three at TTIs. Random sampling was used to get 211 respondents, out of a possible total of about 1 200 students. The investigation of this study was therefore open to all PSTs in the first, second, and third years of the three-year teacher qualification courses – both the Primary Teacher's Diploma (PTD) and the Secondary Teacher's Diploma (STD) that were offered in institutions TA and TE respectively.

The selection of participants, carried out in the two TTIs, with an addition of two key stakeholders outside the TTIs directly associated with ESE activities in Eswatini, was done with great care and consideration. It involved applying purposive sampling to get 15 participants, whose details are provided in Chapter Four. The sample included three heads of institutions, six lecturers, four PSTs, and two officials engaged in environmental and sustainability issues, but not attached to any TTI. The heads of institutions were selected because they were expected to be knowledgeable and therefore informative in the areas of policy and practice regarding ESE: the vice-chancellor of institution TA, the principal of institution TE, and the faculty dean of institution TA were the most knowledgeable because they participate in many

decision-based activities that deal with policy implementation. As such, they were expected to have accumulated valuable knowledge that could be translated into appropriate data. The lecturers were included because they taught PSTs guided by course outlines. Since the lecturers designed the course outlines, they were considered competent, because subject-integration is a key part of their curriculum practices. These six lecturers were considered to be most knowledgeable based on the informal interactions that led to observations that they would add the most valuable data because they demonstrated that they possessed much ESE knowledge which they were willing to share. Four students, two from each TTI, were purposively selected, based on their ability to engage in meaningful two way communication.

The two officials chosen are members of policy-formulating bodies – the Eswatini Environment Authority (EEA) and the MESA Eswatini chapter. They were chosen specifically because they were able to add the most valuable data to this study since they had demonstrated and displayed possession of valuable and relevant knowledge as key presenters during an international meeting on ESD – the 2019 African Regional Centres of Expertise (RCE) on ESD meeting that took place at Luyengo, Eswatini. The same officials regularly participated in the Eswatini MESA chapter meetings and workshops; this was a further confirmation that they were experts in ESE matters and were willing to share their knowledge.

1.7.2.2   Data collection

The data collection methods for quantitative and qualitative data respectively utilise measuring instruments and descriptive information-collection methods characteristic of case studies. Data collection involved gathering information after permission had been granted. It also involved selecting the means by which data was recorded (Creswell & Creswell, 2018).

(i)   Quantitative Data Collection

For quantitative data collection, closed-ended questionnaires were used to collect data from 211 respondents, who were PSTs from institutions TA and TE. For such a large sample, the questionnaire was considered the best tool to use, because large amounts of information could be collected in a short time with limited bias to affect the validity and reliability of the research tool (Creswell & Clark, 2018). This study developed a

structured questionnaire, the details of which are provided in Chapter Four. The leading section of the questionnaire labelled 'Section A' required the respondent to provide personal data without providing individual identity. The second section labelled 'Section B' contained 30 statements to elicit responses meant to gauge the extent to which PSTs were knowledgeable on ESE matters. The third section labelled 'Section C' comprised 30 statements to establish the extent to which a respondent could have developed pro-environmental attitudes.

The questionnaire that was developed for this study was carefully proofread, and the final version which was used in the pilot test was well printed with brief and clear instructions to guide the users responding to the 60 statements designed to address the research problem. A carefully selected individual was requested to conduct a pre-test on the designed questionnaire. This pre-test was carried out by a member of the academic staff at institution TA to seek clarity on aspects of wording, spelling, and grammar and for the pre-tester to suggest any possible corrections and improvements to the instrument. A sample size of 30 respondents was selected for the pilot test. These were sought from institution TC, an institution that had the same curriculum programme as institution TE, but it did not take part in this study. The items in all sections of the questionnaire were the closed-ended type, where respondents chose from predetermined responses. The closed-ended items were scaled without indicating the value of each response scale (McMillan & Schumacher, 2014).

(ii) Qualitative Data Collection

Qualitative data collection in this study was carried out by conducting document analysis, in-depth interviews, lesson observations, field observation of the built physical structures, and the compound grounds and their surrounding areas as part of observations in practice. The selection of questions for the semi-structured interviews was grounded in the Theoretical Framework that laid the foundation to guide this research undertaking and that sought to answer the research question. The carefully selected interview questions in part sought to gauge the degree to which constructivist strategies of teaching and learning were applied; they were part of answering the research sub-questions to realise the objectives of the study. These questions had their content based on the extensive literature study and they revealed key practices

relating to ESE, PSTs, and TTIs. Therefore, questions gauging ESE knowledge and pro-environmental attitudes were based on what was found in the studied literature.

1.7.2.3 Data Analysis

The assessment, evaluation, and interpretation of the collected quantitative and qualitative data were done separately.

(i) Quantitative Data Analysis

For the quantitative data analysis, descriptive statistics were utilised. The research used percentages and means to reduce large numbers of observations into indices which described and characterised collected data using selected variables. The second analysis of the quantitative data collected using 211 questionnaires was carried out using inferential data analysis specifically, the Chi-square non-parametric test. This inferential test of relationships was computed for analysis using the Statistical Package for Social Sciences computer programme IBM SPSS version 28.0.

(ii) Qualitative Data Analysis

The process of analysing qualitative data collected from three sources was carried out differently. Data from interviews were analysed by what Henning, Van Rensburg, and Smit (2013) consider as making sense of worded texts by discovering, more than once, explanations for phenomena from different interviews that yield patterns, categories, and themes as a result of linking sets of relationships; this is a process that Gray *et al.* (2017) refer to as content analysis. Later, the analysis of course outlines as pedagogic texts for the two TTIs, as well as analysing lesson-observation schedules for PSTs, was done, guided by the Bernsteinian-based research tool that was adapted from what was originally designed by Nsubuga (Nsubuga, 2011).

The collection and analysis of data from field observations was carried out using an analytical tool that was designed and guided by Rogan and Grayson's Theory of Curriculum Implementation (Rogan & Grayson, 2003). The analysed data were later merged, compared, and interpreted so that the inferences might clearly answer the main research question.

1.8 MEASURES OF TRUSTWORTHINESS

Trustworthiness in research refers to the integrity and the application of the methods chosen and the precision in which the findings reflect collected data (Delport & Roestenburg, 2014; Statistics Solutions, 2020). These methods have been carefully considered, underpinned by the ethical considerations laid out in the UNISA Research Ethics Code of Conduct (UNISA, 2016). There are differences between the way measures of trustworthiness are presented in quantitative and qualitative research approaches.

1.8.1 Trustworthiness of Qualitative Research Results

Aspects of trustworthiness in qualitative research include credibility, transferability, dependability, and confirmability (Delport & Roestenburg, 2014; Korstjens & Moser, 2018).

1.8.1.1 Credibility

Credibility refers to the credence placed in the truth of research findings to ensure that the findings represent acceptable data that is correctly inferred out of what was originally collected from the research field (Korstjens & Moser, 2018). In this study, correct questions were asked to elicit correct answers by relying on the reviewed literature to guide the process of question formulation; this means that this study focused on some of the questions raised within the literature that pointed to knowledge gaps that needed to be addressed.

1.8.1.2 Transferability

Transferability refers to the extent to which results of qualitative research can be transferred to other contexts (Schurink, Fouché & De Vos, 2014). In order to strengthen the study's usefulness in other contexts, a four-case study was chosen so that the qualitative and quantitative data from all the cases were carefully analysed in order to corroborate and elaborate the study findings in such a way that the combined results were found useful for other settings. In order to make it easier for potential users to judge the results as useful, this study adopted the method that Korstjens and Moser (2018) point out as a way of providing contextual detail in observing and interpreting social meaning when conducting qualitative research.

1.8.1.3 Dependability

Dependability refers to the stability of findings over time (Mandal, 2018). This consistency is partly realised by ensuring that a research process is logical, well documented, and properly audited (Schurink *et al.,* 2014).

Therefore, for this study, dependability was ensured by producing a transparent description of the whole research undertaking, the record of which was safely kept throughout the study. The stability of these findings was secured by ensuring that all interpretations and recommendations of the study were based on the original data received from the field of study. The original data were kept safe on electronic devices by using passwords. Backed-up electronic data kept on e-storage devices, as well as any data in print format, was kept in a locker in a well secured room. The locker keys were placed in a safe place that only the researcher could access. This resulted in having readily available findings that remained consistent and secure over time (Schurink *et al.,* 2014).

1.8.1.4 Confirmability

Confirmability is the extent to which research study findings could be confirmed by other researchers. Therefore, in this study, the researcher objectively audited the whole study to ensure that there was evidence that corroborated the findings and interpretations. This meant that the records of the research path and the findings were kept throughout the study and that the researcher was compelled to carry out the research work with a neutral, unbiased frame of mind to minimise and eliminate personal prejudices, preferences, and predilections that negatively impact the way a researcher evaluates the descriptive data collected from participants (Schurink *et al.,* 2014).

Therefore, the qualitative part of this study adopted the process of data collection, data analysis, and data interpretation. The details included the listing of key topics that were considered unique during data collection and that ensured that other researchers would find it easy to confirm findings from this study. The study reflexively examined the researcher's own conceptions, assumptions, preconceptions, values, and attitudes to gauge how these aspects influenced decision making (Kihn & Ihantola, 2015). To do this effectively, the researcher kept and maintained a reflexive journal and, from

time to time, wrote out incidents taking place in the research process (Schurink *et al.,* 2014).

1.8.2 Validity and Reliability of Quantitative Research Results

In quantitative research, the trustworthiness or the rigour of the research – in effect referring to the extent to which researchers work to strengthen the quality of their study – is achieved through the measurement of validity and reliability (Heale & Twycross, 2015; Noble & Smith, 2015). Validity refers to the extent to which a reality is accurately measured, and reliability refers to the accuracy of measuring that directly affects consistency levels of a measure (Cohen *et al.,* 2018; Creswell & Creswell, 2018).

In order to ensure that the questionnaire used in this study accurately measured the ESE knowledge levels of PSTs, as well as the prevalence of pro-environmental attitudes, it was important to ensure that each of the 30 statements in Sections B and C covered the right content on ESE integration into the curriculum practices of TTIs, the content that, in part, was based on the studied literature. The careful selection of the questionnaire statements ensured that it had content validity (Cohen *et al.,* 2018; Creswell & Creswell, 2018).

Construct validity, which is the ability to draw inferences about collected numerical data that in this study relates to PSTs' ESE knowledge and the prevalence of pro-environmental attitudes, was assured by carefully constructing statements that were quantifiable and could be added up to create a summation that measured the just-mentioned realities. By conducting pilot studies with the draft questionnaire, the researcher was able to establish whether or not the scores obtained fairly corresponded to the respondents' known and observed behaviour; this implies that the questionnaire successfully measured ESE knowledge levels and the prevalence of pro-environmental attitudes. In order to ensure that the questionnaire used in the study was accurate, the researcher used the test-retest-reliability testing by administering the questionnaire to a group of nine carefully selected individuals, who answered it twice, with the answer for the second time occurring after at least 24 hours. Evidence of how validity and reliability of the quantitative research tool were guaranteed was provided to help potential users to assess for themselves the trustworthiness of the whole research exercise (Cohen *et al.,* 2018; Creswell & Creswell, 2018; McMillan & Schumacher, 2014).

1.9 ETHICAL CONSIDERATIONS

This study has been undertaken in full compliance with all the ethical requirements outlined in the UNISA policy on research and ethics (UNISA, 2016). A research ethics clearance certificate which was given by the UNISA Research Ethics Committee is evidence of the endeavour to adhere to the ethical standards set out by UNISA. Additionally, written permission from the director of EMoET and the vice-chancellor of institution TA was obtained, as gatekeepers in the research field. The dean of institution TA and the principal of institution TE were also contacted for permission to carry out research in the two institutions they each headed. Moreover, as were the vice-chancellor, the dean of institution TA, and the principal of institution TE, the researcher sought consent for their participation in face-to-face interviews. Furthermore, consent from selected lecturers and students for participation in face-to-face interviews and lesson observations in their teaching schedules was sought. The PSTs were also contacted for their consent in order for the researcher to administer the questionnaire in both TTIs with an intention of retrieving all the questionnaires that were correctly completed. Letters in print format were produced and delivered by hand to elicit consent from all the participants and respondents. The researcher upheld scientific research integrity by acknowledging all referenced material.

1.10 CHAPTER DIVISION

The dissertation is divided into six chapters. Below is the summary of each chapter.

Chapter One: Orientation to the Study

Chapter One provided a general introduction to the study that includes the background to the research problem, as well as the problem statement. The motivation, personal involvement, rationale, and significance of the study were stated. The aim and objectives, as well as the research methodology, were also presented. The study design, the measures for trustworthiness, and the ethical considerations were given. The chapter ended with an outline of the dissertation structure.

Chapter Two: The Contextual Framework

Chapter Two provides a contextual profile that situates the study in Eswatini. It begins with a literature study presentation that includes a brief history of EE and ESD and a

discussion of concepts that constitute ESE. The literature study further provides an overview of key global issues in the form of theoretical and empirical literature linked to curriculum integration in TTIs, in the context of preparing teachers to learn and teach for sustainability in the 2030 UNGA era. The chapter then positions the Eswatini ESE context providing a geo-physical and cultural background to the study and establishing the knowledge gap this study sought to fill.

Chapter Three: Theoretical and Conceptual Frameworks

Chapter Three outlines the shaping of the theoretical and conceptual frameworks for the study. It begins by introducing the essential underpinning theoretical influences needed to guide the entire study. It discusses the theoretical framework to be made up of three theories: Constructivism, Bernstein's concepts of Classification, Framing and Curriculum Re-contextualisation, and the Theory of Curriculum Implementation by Rogan and Grayson. The conceptual framework is presented, covering all aspects of the title and the research questions in a structural presentation to explain the progression of what is being studied. The diagrammatic presentation, showing the complementation of the variables in the research topic, is also given.

Chapter Four: Research Methodology

Chapter Four offers a detailed account of the research methodology: it discusses the overall methodological approaches and data-generation techniques that are used in the four case studies undertaken. The research processes include the research design for the study, as well as the corresponding research paradigm, and the research type. The discussion on aspects of research methods for data collection, including procedures, tools, and techniques to gather and analyse both quantitative and qualitative data, is presented. Trustworthiness, as part of the effort to strengthen the quality of this study, is discussed. On account of the constitutional rights of human beings, selected aspects of ethical considerations are highlighted and discussed.

Chapter Five: Data Analysis and Interpretation

Chapter Five is a documentation of the collected empirical research data. The analysis and interpretation of findings from the study, guided by the theoretical framework and existing literature, are presented in accordance with the multiple case study design.

Chapter Six: Summary, Conclusions, and Recommendations

In this final chapter, conclusions are drawn and presented, based on the results obtained from the study. Recommendations and final concluding remarks are made in relation to the title of the study. A framework, which could be employed by teacher training institutions to enhance ESE knowledge, skills, and attitudes in the school curriculum, is proposed. In addition, areas for future research and limitations of the study are highlighted. Final concluding remarks on the whole research journey are stated.

1.11   CHAPTER SUMMARY

This chapter provided the introduction to the study and the dissertation research exercise that explains the motivation for conducting the study. The conceptualising of the research context presents the study as permeating the fields of Teacher Education and Training, ESE, and Curriculum Integration in Eswatini. The chapter introduced the main goal of the study, which was to discover the extent to which TTIs in Eswatini prepare PSTs for teaching and integrating ESE into their curriculum planning and teaching practices. The chapter also presented the main research question, followed by the six research questions that guided the study. Lastly, the structure of the dissertation was presented by giving the main contents of each chapter. The next chapter describes the contextual variables that frame this study. The framing in the form of reflective overviews of various studies and the research reports on research work covered, all of which have relevance to this dissertation, are an illustration of the broad nature of this study.

CHAPTER TWO: CONTEXTUAL FRAMEWORK

2.1   INTRODUCTION

The purpose of this study, as outlined in Chapter One, is to establish the extent to which PSTs were being prepared to integrate ESE knowledge, skills and attitudes into the Eswatini school curriculum. This study is founded on the assumption that the value and quality of ESE can be improved further, if closer attention is accorded to ESE, as PSTs are prepared at TTIs to integrate environmental and sustainability education into their curriculum practices. Such an emphasis has the potential to influence ESE infusion positively at various curriculum levels in Eswatini, ranging from primary schools to tertiary institutions. To achieve this purpose, there is a need to clarify, based on available documented literature, the global and local practices, to highlight approaches to the integration of ESE into HEIs curriculum practices, and to align aspects of the 2030 UNGA, a potential key ingredient in ESE integration processes in teacher education in Eswatini. Chapter Two is therefore divided into six parts.

The first part describes the historical roots of the two concepts of EE and ESD that constitute the ESE construct. The second part of the chapter describes curriculum integration at global and local levels with a focus on integrating ESE in HE curriculum practices. The third part of the chapter presents ESE mediation in HEIs, which, according to Mahmud (2017), translates into a learning process and an approach to teaching grounded on the ideals and principles that underlie sustainability. The fourth part of the chapter highlights PSTs and their teacher preparation in TTIs, and practices of how knowledge is constructed to teach sustainability effectively are explored. The fifth part of the chapter presents PSTs as individuals who require transformation to become change agents who can be well prepared to learn and teach for sustainability. The preparation enables them to realise the links that individual actions, behaviour, and pro-environmental messages have in leading to the acquisition of Sustainability Competences (SCs) (UNESCO, 2017a). The sixth part of the chapter presents the SDGs discourse in teacher education and training as CK that is relevant to ESE integration. The 2030 UNGA is discussed to reveal where ESE and targets 4.7 and 4c of SDG 4 should interface to position PSTs as functioning members of the SDG community of practice in their showcasing of the EMoET as potential SDG keepers.

The chapter also highlights ESE integration and implementation in Eswatini in order to centre this study clearly in the Eswatini context.

The method of investigation used for the literature study is that of a critical appraisal entailing a survey of scholarly sources that have provided an overview of current knowledge presented as empirical and theoretical literature findings carried out to critically analyse the research gaps that require attention. The literature thus provides context, relevance, and background knowledge that, in the words of McCombes (2019) and Sachdev (2018), is analysed, synthesised, and evaluated to present a clear picture regarding teacher education and training in the process of establishing the extent to which PSTs were being prepared to integrate ESE knowledge, skills and attitudes into the Eswatini school curriculum. Chapter Two concludes by establishing the knowledge gap that this study sought to fill.

2.2   A BRIEF HISTORY OF ENVIRONMENTAL EDUCATION

Concerning the history of EE, McCrea (s.a.) presents a timeline showing that the roots of EE are widespread and diverse and reveal its rich past which points to an uncertain future. EE origins could be traced to the 18th century philosophers, such as Jean-Jacques Rousseau, who insisted that the content of environment should remain intertwined within education discourse. The 19th Century educator, Louis Agassiz, added her voice to that appeal by encouraging students to engage in Nature Study (McCrea, s.a.). Moreover, Somerville (2016) uses the terms EE and SE in a manner that bears testimony to their combined historical origins and identical practices that are also linked to their corresponding functional outputs. She notes that EE was first labelled as a discipline in 1969, with the term sustainability becoming more established in the 1980s as an attempt to reconcile economic development and environmental conservation. She adds that the formal shift from EE to ESD emerged with the 1987 Brundtland Report, out of which arose the *United Nations Decade of Education for Sustainable Development* (UNDESD).

 The overlaps in the definitions of EE, ESD, and EfS (Education for Sustainability) have persisted as contested issues, the possible reasons for the confusion could be that the three terms are all related to social, cultural, and economic factors that collectively influence human activities. During the 1972 UN conference on the Human

Environment that took place at Stockholm in Sweden, EE started to gain international recognition in an attempt to tackle issues of the human environment, which were globally emerging at the time (UNESCO, 2012; Somerville, 2016).

The recommendations about the environment which were presented during the 1972 Stockholm conference were addressed at the 1975 Belgrade International EE Conference that took place in Yugoslavia, when a global framework for EE was formulated and named the Belgrade Charter. The Charter emphasised lifelong learning as a feature of EE linked to preparing humankind to find solutions to environmental challenges through knowledge empowerment, skills development and the impartation of pro-environmental values and attitudes. The adopted Belgrade Charter of 1975 had statements that constituted a world-wide EE programme targeting educational institutions so that, in every nation, EE would be integrated into formal education programmes. As a follow up to the Belgrade Charter, there emerged the 1977 Tbilisi Declaration with recommendations to help guide efforts to develop EE at national, regional and global levels. Thereafter, at the Rio Earth Summit, a treaty on EE for Sustainable Societies and Global Responsibility was signed in 1992 at Rio de Janeiro in Brazil, highlighting 27 EE principles for equitable and sustainable societies. That summit also delivered Agenda 21, which was proclaimed with an explicit appeal to introduce EfS and ESD in government policy frames using a multi-disciplinary curriculum approach (UNCED, 1992; UNESCO, 1977; 2005; 2012).

As the second decade of the 21st century concluded, the rich EE history was compelling us to move away from concentrating on knowing about the environment to educating in and for the environment. EE, according to Loubser (2011), could have taken a more defined stance on the political, social, and economic systems responsible for the environmental crisis that has now translated to climate change. A brief history of SD and ESD is, therefore, given in order to ground this study further in a foundation characterised by education, sustainability, and the environment.

2.3   A BRIEF HISTORY OF SUSTAINABLE DEVELOPMENT AND EDUCATION FOR SUSTAINABLE DEVELOPMENT

It is noteworthy that the concept of SD is much older than what is presented in many of the scholarly timelines available; it is a developmental concept that possibly existed before the 18th century. Humankind, for example, has always searched for food,

clothing, and shelter. Indeed, there is documentation of sustainable utilisation of natural resources as far back as the beginning of the 18th century. Environmental problems that correlate with sustainability challenges, including deforestation, salinisation, and loss of soil fertility, among others, have occurred in past generations among ancient civilisations, such as those of Egypt and the Roman Empire. Earlier authors have discussed a variety of environmental degradation debates that suggested recommendations to lessen the evil effects of human activities related to farming, logging, and mining. A good example is Germany, where, in the mid-18th century, wood used as a fuel and construction material caused forest to become endangered because of the excessive logging that was carried out to meet the demand for shipbuilding, mining, biofuel, and civil constructions. In the same period, sustainability, as a term, was officially used by Germans in forestry management (Columella, 1948; Pliny, 1938; Strabo, 1949, in Du Pisani, 2006; Van Zon, 2002).

Malthus, however, highlighted the existence of imbalances between population growth and the utilisation of natural resources, even towards the end of the 16th century. He advocated for population growth restrictions to ensure a balance between the population growth rate and food production (Malthus, 1926). Sustainable extraction and regulated utilisation of coal were later promoted in the mid-19th century to protect coal deposits as a non-renewable natural resource that could get exhausted. Interestingly, all the themes covered in the Brundtland Report of 1987 had been earlier presented in 1898 by the author, Wallace, who extensively argued against unlimited natural resource exploitation that included coal, crude oil, natural gas, a variety of other minerals and natural forests. Wallace emphasised that such over-exploitation would hurt future generations (Jevons, 1966; Van Zon, 2002,).

The mid-20th century, the time after the Second World War, witnessed the emergence of our modern understanding of sustainability. This was a period of rapid economic growth and accelerated scientific, as well as technological, innovations that were simultaneously accompanied by a global exponential increase in the human population. The resulting damage to the environment on the planet created awareness of the environmental degradation, which compelled people to change their views and basic assumptions about SD (World Bank, 2018). In this connection, the foundation and principles of SD were set in motion in three phases.

The first phase, which could be referred to as the pre-Stockholm period, involved theorists such as Marx, Malthus and Richard, who recognised the intersection between development and environmental requirements. Consequently, an alarm was raised on the negative effects of economic development on the environment at the first UN conference on the human environment that was held in Stockholm in 1972. At that conference, socio-economic, political and educational recommendations were given to guide nations on proper environmental management procedures and practices (Drexhage & Murphy, 2010; Mebratu, 1998; United Nations, 1972).

The second phase occurred between the Stockholm conference and the Brundtland Report. During this phase, there was a consolidation of the concept of SD, and a more precise definition was formulated: 'Development that meets the needs of the present without compromising the ability of future generations to meet their own needs' (WCED, 1987:43).

The 1992 Earth Summit in Rio de Janeiro set in motion the third phase that was dominated by the promotion of ESD. At that summit, Agenda 21 contained a direct, unambiguous appeal to introduce EfS and ESD in national curricula using a multi-disciplinary approach (UNCED, 1992). This UNESCO-guided promotion of ESD eventually led to the United Nations Development Education on Sustainable Education (UNDESD) that lasted from 2005 to 2014 and was firmly grounded on a three-decade history of environment and development education (UNESCO, 2009). Operating within the UN guidelines, governments and international agencies made education a joint priority in their development initiatives, such that, from the year 2000, they adopted the: Millennium Development Goals, Education for All: The United Nations Literacy Decade and the UNDESD (Wals & Kieft, 2010).

After the end of the UNDESD decade, a new, ambitious, universal agenda to transform our world emerged: the 2030 United Nations Global Agenda (UNGA). SD is, therefore, considered to have been founded on social-economic development, interfacing with ecological restrictions in the context of meeting human needs for current and future generations, implying that complete SD can possibly be attained, once there is equilibrium between environmental sustainability, social sustainability and economic sustainability (Klarin, 2018; UNESCO, 2012; 2017a). The interconnectedness of terminologies linked to ESE, as well as the complexity of sustainability as a concept,

creates a difficult combination to integrate into educational learning outcomes (Du Pisani, 2006). Hence, SDGs should be reconstituted to produce appropriate pedagogies and learning strategies. The 2030 UNGA, in effect, provides humankind with fresh impetus to increase the implementation of ESD so that learners at all educational levels may be enabled to acquire the knowledge and skills needed to promote sustainable living (Kioupi & Voulvoulis, 2019; UNESCO, 2018a).

As of 2020, five years into the 2030 UNGA, there was no unified approach on how EE and ESD should be successfully mediated in educational systems of different nations that are often plagued by political interference. Many of these systems resort to non-accommodative, traditionally underpinned pedagogical approaches, with few competent teachers capable of integrating EE and ESD into their curriculum practices (UNESCO, 2012; 2017a; 2017b).

Clearly, the collection of historical narratives that have just been presented point to the fact that meaningful support for ESE integration can be realised if education is used as an instrument to achieve SD by integrating SD principles into existing curriculum systems. To date, EE and ESD have promoted knowledge, skills, values and attitudes that empower learners to develop SCs to enable them to act for environmental integrity and economic viability in societies that promote justice. Accordingly, there is a high demand for intentional, strategic and continuous integration practices of ESE in HEIs' Curricula (UNESCO, 2017a; 2017b; 2018b).

The history provided in the above section forms a firm foundation for this study to help establish the extent to which PSTs were being prepared to integrate ESE knowledge, skills and attitudes into the Eswatini school curriculum. This foundation became the starting point of my understanding of how EE and ESD are integrated into HEIs.

2.4 PRE-SERVICE TEACHER TRAINING IN ENVIRONMENTAL AND SUSTAINABILITY EDUCATION (ESE) KNOWLEDGE, SKILLS, AND ATTITUDES IN THE SCHOOL CURRICULUM

The global diversity of perspectives and experiences are a scarce resource that cannot be sacrificed…. Intellectual pluralism is a condition for our common survival (Avery & Nordén, 2017:678).

The guided, supervised preparation of student teachers who are training to become professionals was considered an important aspect of research in this study to establish the extent to which PSTs were being prepared to integrate ESE knowledge, skills and attitudes into the Eswatini school curriculum. The following two sections on theoretical and empirical literature study highlight PST education and training in ESE knowledge, skills and attitudes in the school curriculum.

2.4.1 Theoretical Literature Study on PST Training in ESE Knowledge, Skills, and Attitudes in the School Curriculum

The combination of theoretical knowledge and experience that constitutes learning is a continuous cycle involving acquiring knowledge from life experiences and using it in new ones. To that effect, PSTs ought to familiarise themselves with in-service, field experiences by observing the application of teaching methods and techniques, classroom management, classroom communication, lesson preparation and schemes of work so that they may be able to put into practice what they were taught theoretically (Arseven, 2018). It is the 'putting into practice' (Carl, 2010:133) that this study investigated through lesson observations to establish the extent to which their pre-service teachers (PSTs) training has prepared them for teaching and integrating ESE into their curriculum planning and teaching practices. Pre-service teachers are aware of the importance of ESD and have the potential to acquire pro-environment, sustainable behaviours. Therefore, upon graduating, their professional identity should translate into an understanding of, and a willingness, to engage in ESE matters (Ates & Gül, 2018).

Nazarenko and Kolesnik (2018) point out that the level of environmental knowledge is the leading component in raising environmental awareness; even so, such knowledge seems to be lacking among PSTs. Nazarenko and Kolesnik (2018) note that environmental knowledge awakens the students' cognitive processes to enable them to make inferences on the reasons for persistent global environmental challenges. More still, they argue that lectures, seminars, and workshops, as pedagogical modes and methods, are incapable of shaping proactive, pro-environmental attitudes that guide individuals to assess and solve environmental problems. Their conclusion is that promoting environmental awareness as an educational task ultimately results in raising interest in environmental activities among PSTs and the learners with whom they interact. The discussion by Ates and Gül (2018), as well as the conclusion by

Nazarenko and Kolesnik (2018), was considered important for this study because they strengthened my argument that in order to promote ESE integration, PSTs needed to be investigated to determine how the knowledge, skills and attitudes they acquired in TTIs were applied in their curriculum practices. That is why with this study, I ensured that the questionnaire administered to 211 PSTs was designed to gauge the levels of ESE knowledge and the prevalence of positive attitudes towards the environment.

In the same vein, Qablan (2018) argues that the failure of educators to redirect the teaching and learning approaches in ESE learning spaces could be the reason the education systems are not outputting learners with pro-environmental values and attitudes that allow learners to demonstrate sustainable practices and lifestyles. He points out that the global action programme on ESD was meant to promote the provisioning of curriculum experiences characterised by the acquisition of knowledge, skills, values and attitudes, which are required to play a positive, meaningful role in SD activities. To that effect, the empowering of educators and trainers becomes pivotal in the attempt to introduce sustainable development, making it imperative for there to be professional development that targets educators. This would result in the inner transformation of participants enabling them to adjust their instructional practices and to create contextualised learning spaces where problems are identified and where solutions are sought. Such learning arenas promote self-regulated learning strategies guided and managed by democratic principles. In-service educators with such qualities can be products of TTIs that redesign their whole curricula to support ESE.

The implication for ESE integration, as explained by Qablan, is the replacement of traditional curriculum approaches that have not produced results with new ones that have proved to work. This research used Qablan's (2018) recommendations to transform the educator: it formulated some of the interview questions for lecturers that asked for their views on the best approaches for preparation of PSTs for teaching and for integrating ESE into their curriculum planning and teaching practices.

Since awareness is realised through teaching and learning experiences, the research investigated institutional policy measures that were being followed to foster knowledge acquisition and to promote the development of pro-environmental attitudes among PSTs.

Aspects of improving TTI curriculum practices, as suggested by Qablan (2018), such as incorporating SD activities and lifelong professional development of educators, were investigated in this study during field observation. This was guided by Rogan and Grayson's (2003) Theory of Curriculum Implementation because incorporating such activities requires the built infrastructure and the natural surroundings where the activities can take place. Some interview questions elicited the views of lecturers on the role of personal professional development, if at all present, that was played in their lives in relation to ESE integration in the two institutions where the participants worked.

The next discussion, a collection of empirical study findings, is a call to realign theory and practice for meaningful PST preparation.

2.4.2 Empirical literature study on PST training in ESE knowledge, skills and attitudes in the school curriculum

It is worth noting that the gap between policy and practice has persisted and may increase even further, because discourses of policy and practice have not considered ESD an urgent matter (Stevenson, 2007). Many national educational policies including PST preparation, lack accountability measures and continue to apply traditional teaching and learning approaches as they mediate ESD. Stevenson examined protracted ESE discussions that spanned two decades and compared aspects of policy and practice. He notes that many institutional structures and norms of education and training do not embrace enquiry-based action-oriented ESE practices, prompting him to argue for the creation of learning construction spaces, where discourses of professional learning and engagement in ESE are promoted to ensure that practice is shaped by what is expressed in the policy documents. In this study, I applied Stevenson's argument on policy and practice during the interviews with PSTs and lecturers in order to discover how their curriculum views were aligned to the policies and prescribed practices.

Salvioni, Franzoni and Cassano (2017), using document analysis, observed sustainability-governance orientations of three institutions to discover the correlation between the degree of sustainability culture in the management structures of the institutions and the position of the institutions' global ranking as a tertiary institution. They had earlier noted that the best-ranked universities had a management approach established on a shared vision of SD, spearheaded by the leaders who affirmed a

sustainability culture. Their empirical results showed that there was a higher integration and inclusion of ESE themes in the institutional, managerial research and teaching activities of the highest ranked universities, compared to universities in subsequent positions. They confirmed that sustainability presents opportunities to improve educational systems, as universities with the highest rankings demonstrated a governance culture with a clearer orientation to sustainability lifestyles. A sustainability culture was not found in the lowly ranked universities, even though they showed a leaning towards sustainability, because they failed to demonstrate an ability to integrate, share and include sustainability in their governance and institutional culture.

The document analysis results by Salvioni *et al.* (2017), which were mentioned earlier, were useful in this study because they guided the search for a sustainability culture in the management structure with the purpose of creating pro-ESE learning construction spaces that are needed in PST preparation, as Stevenson (2007) had pointed out. Some of the interview questions that were presented to the vice-chancellor of institution TA, the dean of institution TA, and the principal of institution TE, which sought to confirm the extent of integrating ESE themes in the two TTIs, were formulated, using the findings of Salvioni *et al.* (2017), which correlated the ability to integrate ESE and the inclusion of a sustainability culture in institutional governance structures.

In another empirical literature finding that dealt with PST preparation, Avery and Nordén (2017) note that sustainability research in HE can transform professional practices through structurally mediated interconnections in HEIs. Their document analysis compared different institutional configurations at selected Scandinavian universities and sought to discover potential drivers and enabling mechanisms that have cross-environmental connections that were underpinned by trans-disciplinary integrative curriculum practices. They lament that highly formalised learning outcomes during PST preparation tend to leave little space for negotiation and creativity that supports paradigmatic shifts. The subject insulations that characterise the discipline-oriented university curriculum settings do not promote cross-disciplinary learning, are considered to be the key to dealing with real-life situations, and are usually multifaceted, complex encounters. Such practices obstruct collective reflection and curriculum cross-fertilisation in such a way that, in the end, they operate against

transformative change that is potentially realised through sustainability engagements. Avery and Nordén (2017) advise that opportunities for collaboration should be identified in locally contextualised practices to ensure that academic knowledge is made relevant in real-life situations. The document analysis that I carried out in this study investigated the presence of institutionally documented connections that supported ESE in order to explore how, during PST preparation the different enabling mechanisms were aligned with existing disciplines. The global networks that are discussed in the next paragraph are such contexts where opportunities for collaboration can be found.

Regional networks, such as the African Regional Centres of Excellence (RCE) that held its 2019 regional meeting at Luyengo, Eswatini, are presented by Scoullos, Malotidi, Lindroos and Suomalainen (2017) as bearing collective efforts in promoting ESD and EE through structured networking, as HEIs become more open to each other to forge partnerships that promote accountability at local, national and global levels. This can only be realised when SD is explicitly recognised as an item of central importance that universities need to promote by fostering research, sharing knowledge and devising new approaches to SE. The need for universities to integrate sustainability into the teaching and learning strategies is closely paired with the need to offer opportunities for sustainability competence development to their staff; this was an aspect that this study investigated during the interviews with the dean of institution TA and the principal of institution TE with the purpose of finding out whether or not their staff professional development programmes include components of ESE as part of their curriculum structures.

The case for ESE can best be strengthened by training staff who prepare PSTs, as pointed out by Scoullos *et al.* (2017). This fact led the researcher in this study to ask lecturers explicitly whether or not they had, at any one time, been exposed to ESE curricula practices and if not, how confident they were, regarding mediating sustainability, to prepare PSTs for teaching and integrating ESE into their curriculum planning and teaching practices.

Sánchez-Carracedo, Carbonell and Moreno-Pino (2020) interviewed 16 Spanish HEIs to find out whether they had integrated sustainability into their teacher preparation programme. They did this by analysing the number of subjects that promoted

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sustainability and they discovered that it was present in the courses offering Education and Engineering degrees, even though they did not find any clear strategy for implementing sustainability in all of the 16 universities. These findings point to the fact that content which promotes sustainability in any given course outline, should contain ESE implementation strategies. Therefore, in my present research study, I not only carried out document analysis on course outlines, but also interviewed lecturers to elicit information about their views on how ESE should be implemented to prepare PSTs in the best way to teach and integrate ESE into their curriculum planning and teaching practices.

The literature on teacher education and training in TTIs provided information on the characteristics of good learning construction sites that were able to prepare PSTs by equipping them with the knowledge, skills and attitudes to apply in their curriculum practices. Preparing PSTs is not complete without the development of SCs. Establishing the extent to which TTIs in Eswatini prepare PSTs for teaching and integrating ESE into their curriculum planning and teaching practices is carried out through the lenses of the 2030 UNGA, with specific reference to SDG 4, targets 4.7 and 4c and is discussed below.

2.5 SUSTAINABLE DEVELOPMENT GOAL 4 INTEGRATED INTO THE TEACHER TRAINING INSTITUTIONS' CURRICULUM

> Universities, with their broad remit around the creation and dissemination of knowledge…have a critical role to play in the achievement of SDGs (SDSN, 2017).

2.5.1 Theoretical Literature Study on Integrating SDG 4 into the Teacher Training Institutions' Curriculum

HEIs have key roles in contributing to the 2030 UNGA, because many of their policy records bear testimony to their readiness to fulfil their critical roles, despite that, there seems to be little guidance on the practicality aspects of this endeavour. The choice for any university to contribute meaningfully to the global agenda is determined by their local contexts that incorporate, among others, their values, priorities and educational research strength. Guidelines underpinned by reliable research data are required to help tailor workable approaches of global standards. The main areas of contribution include providing students with knowledge, skills and motivation to

understand and address SDGs (UNESCO, 2017a). Such curriculum practice is supported by in-depth academic expertise that is present in HEIs to provide accessible, affordable and inclusive education. Part of HEIs' capacity building for students includes supporting research efforts so that evidence-based solutions, pathways and innovations may be made available to underpin the implementation of SDGs through traditional disciplinary settings, as well as interdisciplinary and trans-disciplinary alternatives. Through research endeavours, HEIs can provide the necessary knowledge to achieve SDGs by tackling evidence-based solutions of complex environmental, economic and social issues (Bhowmik, Selim & Huq, 2018; El-Jardali, Ataya & Fadlallah, 2018; Mawonde & Togo, 2019; Trencher *et al.,* 2016).

The preceding discussion identifies the contextual factors affecting the implementation of SDGs in HEIs, which were applied in this research to explore how the two TTIs that participated in this study provided PSTs with knowledge, skills and motivation to understand and address SDGs. Consequently, the document analysis conducted in this study investigates how course outlines of different subject areas have embedded PCK that addresses the realisation of targets 4.7 and 4c of SDG 4 which are given in Chapter One as Footnote Two. For all the participants interviewed, among other aspects, their levels of awareness of the targets were investigated. This gave an indication of the level of engagement with the 2030 UNGA by the selected participants. This meant that a section of the questions formulated for the interviews focused on SDG contextualisation in TTI curriculum practices.

The proper implementation of all the 17 SDGs hinges on the quality of organisational governance, culture and operations of HEIs. The HEIs are expected to link their external leadership roles as facilitators of cross-sectoral dialogue and action in aspects, such as designing SDG policies and an explicit demonstration of commitment to the SDGs. An approach that focuses on the university as a whole involves the following: mapping what is already being done, establishing internal capacity to promote SDG ownership, identifying priorities, opportunities, and gaps, integrating, implementing, and embedding the SDGs in university strategies, policies and plans to monitor, evaluate and communicate their actions (SDSN, 2017). This study considered the key implementers of SDGs. Therefore, some of the questions in the interview schedules for the dean of institution TA and the principal of institution TE sought to establish how the two, as leaders of TTIs, were promoting the 2030 UNGA to support

sustainability thinking and practices as part of their preparing PSTs for teaching and integrating ESE into their curriculum planning and teaching practices.

Over time, the world system has relied on education systems that do not necessarily support sustainable thinking and practice. If we are to realise the SDGs, in an effort to transform humankind and save our planet, building PSTs' understanding of the areas of ESE to empower them as change agents, should be prioritised, as educators proactively search for opportunities to transform HEIs' curriculum policies and practices. Students complete their university education and assume responsibilities in the workplace having been educated in ways that perpetuate existing professional practices and cultural assumptions that compromise the wellbeing of the planet we inhabit (Mulá *et al.,* 2017).

SDGs seek to improve the standard and quality of life through 17 goals, and this realisation is guided by the 2030 UNGA framework for action. Eswatini, as an active global partner in the 2030 UNGA, has established national frameworks, policies and implementation strategies commensurate with the Agenda (UNESCO, 2017a; UNESCO, 2018a). The literature projecting Eswatini as an active global partner in the 2030 UNGA, provided the researcher with guidelines to investigate how two key environmental stakeholders attached to EEA and MESA worked with government to support efforts to promote ESE in HEIs as part of the renewed focus on effective teaching and learning.

Similarly, HEIs are epistemic communities uniquely positioned to facilitate the integration of SDGs in their curriculum systems, as well as in the local communities they serve. After proper training, teachers are expected to be key participants in mainstreaming sustainability at community levels, without compromising the 2030 UNGA outcome expectations. Whereas the UN bodies have urged those who deal with sustainability issues to focus on identifying the underlying causes of sustainability problems, many teachers claim that SD as a concept is abstract and difficult to conceptualise. Thus, teacher educators should position themselves as change agents who have the capability to introduce new ideas in their teacher education practices as they closely collaborate with PSTs to confront challenging sustainability issues (Ates, & Gül, 2018; Troschke, 2015). Highlighting HEIs as epistemic communities offered the researcher reliable guidelines for analysing curriculum documents to establish how

TTIs' curriculum practices promoted sustainability aspects of environmental integrity, economic viability and social justice that are also highlighted in the 2030 UNGA literature (UNECA, 2017).

The 2018 SDG Accord Progress Report (APR) (from the heads of tertiary institutions who have signed the SDG Accord) notes that the most common areas in which institutions have attempted to embed the SDGs, were in the areas of curriculum and pedagogy. The report, nevertheless, points out that not much has been done in the area of research, and it further states that the biggest institutional challenge to engaging with SDGs is lack of staff capacity, resources and a framework to operationalise, as well as to integrate SDGs into their existing programmes (HLPFSD, 2018). For such globally shared goals to gain rooting in Eswatini, careful planning is needed for their smooth operationalisation. This calls for co-operation, as well as collaboration, to ensure that the implementation priorities are carefully selected and aligned with national strategies that have clearly worked out with follow-through mechanisms (APR, 2018; Didham, 2018; SDGCA & SDSN, 2018). This study sought to establish whether the observation in the SDG APR (HLPFSD, 2018) that tertiary institutions had attempted to embed SDGs in their curriculum and pedagogical practices was true for the two TTIs in Eswatini. It was based on the Progress Report that this study, during the interviewing of the dean of institution TA and the principal of institution T, sought to verify whether or not the selected TTIs had adequate staff capacity, resources to support ESE integration and an operationalising framework to integrate SDGs into their existing programmes.

Institutional policies guide practices, and this cannot be different for SD, especially at a time when more HEIs are realising the relevance and centrality of SD activities. One key barrier to SD integration is the lack of institutional sustainability policies. The 2030 UNGA calls for more policy engagement to strengthen and guarantee institutional commitment and accountability that are measurable and that use indicators and the development of competences (UNESCO, 2017a). SD policies need to be incorporated into the administrative fabric of institutions to improve the management of all resources, including community relations and to support the continuous sharing of new practices and innovations (Filho *et al.,* 2019; Hák, Janoušková & Moldan, 2015; Shiel, Smith & Cantarello, 2020). This study also investigated policies that guide institutions TA and TE in matters on sustainability and the environment in order to determine how

they impact the preparation of PSTs for teaching and integrating ESE into their curriculum planning and teaching practices.

The demand of many actors to participate on the global stage in support of the 2030 UNGA is likely to slow down the pace of implementation; this is according to Pesce-Monteiro (2019), who further reminds us that ownership of the 2030 Agenda belongs to the UN's 193 member states and their citizens that form the global civil society. The disturbing deterioration of the global situation, because of climate change, has been exacerbated by the global Coronavirus Disease of 2019 (COVID-19) pandemic that swept through our biosphere as we came to the end of the second decade of the 21st century. Climate change has not received the same intensity of measures taken by governments against COVID-19 to force people into lockdowns. Kolinjivadi (2020) further argues that both climate change and the COVID-19 pandemic have their roots in the deadly and disruptive pursuit of infinite growth at the expense of the environment, as humans harvest natural resources of the planet interfering with nature's ability to balance itself, while at the same time adding a large amount of waste to cause climate change. He laments that the same process is responsible for the COVID-19 pandemic outbreak in that the need for more natural resources has forced humans to encroach more on natural habitats, thus exposing themselves to lethal pathogens. He argues that, even though we are not updated on the global death toll caused by climate change, it is, in the long term, much deadlier than COVID-19. The rapid and urgent actions in response to COVID-19 are a clear illustration that humankind can act collectively to save planet earth (Kolinjivadi, 2020; Rockström & Klum, 2015). The information on global actors slowing down the pace of implementation, coupled with the discussion on COVID-19, can offer reliable guidelines for contextualising the SDG discourse in teacher education and training. During the interview process, this study focused on the ownership of the 2030 Agenda in the light of prevailing global challenges so that it might elicit ideas from two officials attached to EEA and MESA about how best sustainability could be promoted in such challenging times.

The theoretical literature presentation on contextualising the SDG discourse was a resourceful guideline for this study. The practice of preparing PSTs to learn and teach for sustainability through the lenses of the 2030 UNGA that constituted these empirical study findings is presented having been carefully selected to help establish the extent

to which PSTs are being prepared to integrate ESE knowledge, skills and attitudes into the Eswatini school curriculum.

2.5.2 Empirical Literature Study on Integrating SDG 4 into the Teacher Training Curriculum

The goal to integrate the principles, values and practices of SD into all aspects of education and learning initiated by the UN, requires substantive, significant and meaningful adjustments in both curricula and pedagogical practice in HEIs. This will help to confront dominant epistemologies and discourses and to challenge prevailing sustainability lifestyles (Howlett, Ferreira & Blomfield, 2016). SDGs have the potential to support HEIs' efforts to holistically integrate sustainability across the entire university fabric constituted by Campus Structure, Curriculum Practice and Community Engagement. Securing the full participation of academic staff may not be easily realised (Shiel *et al.,* 2020). Attaining SDGs will require HEIs to assume a leading role through research and redirect the construction of knowledge through the lenses of the 2030 UNGA (Filho *et al.,* 2017). The researcher had previously encountered dominant epistemologies and discourses embedded in traditional curriculum practices during his interactions with lecturers and students, but he had never attempted to establish how such patterns of behaviour could influence ESE integration. Because of this, in this study, during the interview process with the heads of the TTIs, he sought to establish if any significant adjustments have been made to accommodate the 2030 UNGA – an aspect that Howlett *et al.* (2016) pointed out as an important step in the realisation of SDGs. The construction of knowledge through the lenses of the 2030 UNGA is a multifaceted idea; on account of this, this research structured some of the interview questions to each of the participants to elicit their views on targets 4.7 and 4c of SDG 4. (See Footnote Two in Chapter One.).

Wellington University in New Zealand is a good example of an HEI that has embraced the SDG framework as a tool to bring about change and that used an integrative approach characterised by research practices, trans-disciplinary practices, extra-curricular activities and community service practices. Wellington University mapped its 2017 curriculum against the SDGs with the intention to track their own progress in terms of realising the global goals. In similar cases, HEIs in the United Kingdom (UK), including the University of the West of England, Nottingham Trent University, Canterbury Christ Church University and the London School of Economics and

Political Science have demonstrated the presence of sustainability-linked teaching, research and community outreach, even though they failed to establish a strategic and integrative approach to address SDGs (Shiel *et al.,* 2020). The empirical research findings of Shiel *et al.* (2020), which have recently been presented, highlight a unique orientation to curriculum thinking, as they promote innovative ways to curriculum integration. Taking their findings as a reliable guideline for this study, the current research investigated the type of integrative approaches that the two TTIs were applying to benchmark them against the four practices that Shiel *et al.* (2020) pointed out. During the separate interview processes with the vice-chancellor of institution TA and the two heads of the TTIs, questions were asked how, as leaders, they strategised to integrate SDGs into their curriculum structures.

In another case highlighting contextualising the SDG discourse in teacher education and training, Giangrande *et al.* (2019) sought to develop an evaluation instrument to gauge what SCs could develop through target 4.7 of SDG 4. They used dialogical intervention in trainer workshop meetings that included ESD experts. They proposed using the concept of multiple intelligences as a mechanism that students could use to apply acquired SCs. Their evaluation mechanism emphasised the importance of intrapersonal transformation of students and educators to realise the transformed world to which Agenda 2030 aspired. They also suggested, as means of assessment, a framework that emphasises active learning through the application of multiple intelligences. This current study applied dialogical intervention, as highlighted by Giangrande *et al.* (2019), during the interviews with lecturers, to find out how they communicate with their students.

At Bournemouth University (BU) in the UK, Shiel *et al.* (2020) found that the university had endeavoured to integrate sustainability into their curriculum practices by using their grounds as a medium for students to try out campus-greening initiatives. BU sought to re-invigorate their ESD curriculum agenda through human resource capacitation as they focused more on extra-curricular aspects of the institution to exemplify the best practices in environmental management. This attempt met with resistance from within, however, which implied that there was limited impact on wider curriculum change, because it was difficult to inspire the wider body of academic staff during the promotion of good ESD teaching practices. Usually, securing academic staff participation is hampered by lack of time, lack of funding and lack of institutional

support, as pointed out by Scarborough and Cantarello (2018). This observation was confirmation of what had been noted two years earlier by Scarborough, when she investigated barriers to the development of pro-environmental behaviours in BU and found that the main perceived barriers to deeper commitments to engaging with environmental initiatives were lack of time, funding and organisational support (Scarborough & Cantarello, 2018).

In line with what Shiel *et al.* (2020) suggested, the current research asked lecturers to share their views and experiences about using their TTI grounds as living laboratories. Later, during field observation to collect data for this study, the research took note of any indicators on whether or not the institutional grounds and surrounding areas are in any way being utilised as living laboratories to promote ESE. The interviews with each of the TTI leaders elicited information on how they fare in securing academic staff participation – a task that Shiel *et al.* (2020) predicted as being a difficult one. Barriers to the development of pro-environmental behaviours became a focus of investigation during the interview process with lecturers, and this study compared these barriers with the ones mentioned in Scarborough and Cantarello's (2018) findings.

The shift of approach that aligned the BU with SDGs involved stepping up communication, which Djordjevic and Cotton (2011) consider to be the key to engaging with a wider academic audience. Academics were requested to submit case studies to highlight how they would incorporate SDGs into their academic programmes. Even though none submitted one that incorporated SDG 4, the development of the BU 2025 Strategic Development Plan created the opportunity to include SDGs in their subject modules. The strategic plan incorporated SD into their academic programmes to ensure that students were encouraged to value and embrace sustainability principles. Additionally, training on the importance of sustainability was provided to student representatives from all faculties. Academics pledged to integrate SDG content into their teaching and learning experiences using prescribed guidelines (NUS, 2018). The BU interventions yielded results evidenced by many social and environmental improvements. In order to support the SD inclusions in the 2025 Strategic Development Plan, electronic multimedia communication was promoted, along with workshops and presentations, to ensure the realisation of collective responsibility for achieving SDGs. As a good example of a holistic approach, where actions to inspire

change were prioritised, the BU narrative, presented by Shiel *et al.* (2020), informed the formulation of some of the interview questions to TTI leaders in order to establish how they guide academic staff to prioritise and to strategise the implementation of the 2030 UNGA.

Kopnina (2018) integrated ESE into her curriculum practices, with specific emphasis on SDGs. Her aim was to engage HEI students in critical discussion and reflexive social learning in order to stimulate students' cognitive processes so that they might improve their critical, imaginative and innovative thinking about SD, in general, and about the SDGs, in particular. Her multiple case study carried out in three HEIs in the Netherlands, included a combination of instrumental eco-centric approaches entailing transformative, participatory and pluralistic dimensions. Students' perceptions of SD were gauged, as sustainability courses were taught to increase their understanding of and their concern for the outcomes of the SDGs. She combined instruction and theoretical literature in lecturing to raise awareness with reflexive thinking so that pluralism might be stimulated. Assessment and evaluation took the form of written assignments and group projects.

Kopnina's (2018) research methods involved lesson observations, student reports and summative student evaluations. As a lecturer, she reflected on her own education practice relating to teaching SD. In the end, she demonstrated that the curriculum could be used to stimulate students' ability to critique policies and practices, such as those hidden within the ironies and paradoxes of SD rhetoric, part of which is embedded in SDGs. At all three universities, students were led to the realisation that what was currently being communicated as SD information in general terms, as well as through the 2030 UNGA campaign, was not adequate to develop critical, imaginative and innovative thinking about sustainability (Kopnina, 2018). The statement by Kopnina (2018) regarding the inadequacy of the 2030 UNGA, prompted the researcher to ask lecturers to share their views on how they thought targets 4.7 and 4c could be utilised in the form of PCK.

In yet another case, Djordjevic and Cotton (2011) explored the possibilities and problems of engaging in effective communication about sustainability in HEIs. It is potentially difficult to frame messages to communicate sustainability, yet communication is essential if sustainability is to be embraced and properly integrated

into curriculum practices of HEIs. Case study research was conducted in a new post-1992 UK university that communicated the sustainability agenda using the following: a triannual newsletter, personal professional development initiatives in the form of sustainability staff development courses, research paper presentations, interdisciplinary workshops featuring guest speakers, an annual conference and an electronic device beaming as a green screen communication platform.

Using an instrumental case study approach, Djordjevic and Cotton (2011) found that clear communication was hampered by a lack of an acceptable definition of sustainability. This was exemplified by resistance to change and clashes between the needs and expectations of staff members, because participants in the study felt there was a lack of an agreed definition or a shared understanding of sustainability and that this was compounded by the prevalence of individual differences in values and attitudes. They recommended that sustainability messages should be clear, precise and coherent and they should be supported by a working definition of sustainability. Dialogue and a democratic approach should be applied so that sustainability messages might be transacted in order to give rise to change. The call for effective communication by Djordjevic and Cotton (2011) prompted this researcher to include some interview questions to address aspects of communication, which PSTs could consider helpful in promoting ESE integration.

The extent to which HEIs were using SDGs to promote sustainability is an indication of the level of emphasis HEIs placed on the 2030 UNGA. Many critics insist that SDGs are too broad and too unfocused, unrealistic and vague. Using a questionnaire, data on SDGs and Sustainability Teaching at universities were collected using an on-line tool in the form of Google Forms to cater for international on-line participants that included rectors and office managers in universities sampled from 17 countries. It was found that many HEIs were still at infancy level with regard to SDG implementation and this suggested that HEIs needed to engage in practice-oriented applied-research that integrates SDG issues with other sustainability challenges (Filho *et al.* 2019). These findings address one of the objectives in this study that seeks to determine the extent to which targets 4.7 and 4c of SDG 4 were being integrated into the TTI curriculum texts. This means that during the analysis of curriculum documents, this research sought to discover how the 2030 UNGA had been integrated into the course outlines and the strategic plans of institutions TA and TE.

It is very important for faculty members to have a proper understanding of sustainability matters because this directly affects their ability to implement ESE in the specific courses that they teach. Alkhayyal, Labib, Alsulaiman and Abdelhadi (2019) obtained data on faculty-sustainability awareness levels based on a comparative study among different departments at a university in Saudi Arabia. They explored the academia's levels of understanding sustainability issues and their value positions on the sustainability concept in its environmental, economic and social contexts as a 'greening agent'. They further investigated the extent of sustainability integration into participants' courses, specifically focusing on relevance and contextualisation. They found that, at the Saudi university, a systemic commitment to integrate sustainability had not been done and that sustainability had not been adequately incorporated into the institution's curriculum practices. In addition, key competences for sustainability programmes and courses had not been activated to support their development among students. Their findings influenced this study, as explained in the next paragraph.

The broad story of SDG implementation that was discussed with the vice-chancellor of institution TA and the principal of institution TE during the separate interviews which were conducted in order to find out how far their TTIs had gone with implementing the 2030 UNGA. During the investigation on the kind of research activities in which the two TTIs were engaged, the practice-oriented-applied-research recommended by Filho *et al.* (2019) was also mentioned. Additionally, the interviews questioned the two leaders regarding a systemic commitment to integrate ESE, as recommended by Alkhayyal *et al.* (2019).

Tilbury (2011) identified commonly accepted learning processes aligned with ESD and related learning opportunities contributing to SD and sustainability lifestyles. Her review identified key processes underpinning ESD frameworks and practices as processes of collaboration and dialogue, whole system thinking, curriculum innovation and active, participatory teaching and learning experiences. She lamented the difficulty in accessing recorded data on ESD processes and learning opportunities and she noted that many were undocumented, because much of the literature did not contain sufficient information on how objectives and outcomes of projects that were carried out had been achieved to provide a fair picture of effective approaches and processes. By processes, she meant pedagogical approaches taken as engagement opportunities adopted to implement ESD in different levels of education settings. ESD,

she adds, remains poorly researched and weakly evidenced. Her empirical literature findings show that changes are being nurtured at social, economic, environmental and educational levels. Her analysis focused on a partnership programme with MESA. The programme works with the African Association of Universities, UNESCO, and other relevant partners to infuse environment and sustainability concerns into universities in Africa. The MESA programme promotes ESD as a learning process that simultaneously introduces pedagogical innovations within an ESD framework. Relying on key learning strategies, MESA's approach broadens knowledge construction because the trans-disciplinary nature of sustainability is put into consideration and acknowledges that multiple sources of knowledge exist in the learning process (Ogbuigwe, 2008). Five years into the Global Agenda 2030, MESA continues to support the integration of ESE knowledge and practice into HEIs' Curriculum Policy and Practice. The commonly accepted learning processes pointed out by Tilbury, tend to be part of established traditional pedagogic practices, even where one finds partnership programmes such as MESA. Therefore, this current study investigated how MESA activities, if at all present, contributed to the inclusion of targets 4.7 and 4c of SDG 4 into TTI curriculum practices and also explored how such a contribution prepared PSTs for teaching and integrating ESE into their curriculum planning and teaching practices.

At the University of Aruba in the Southern Caribbean Netherlands Kingdom, a course module was used to demonstrate how sustainability research could be put to good use. First-year Aruba students followed a four-week course module that included a study on SDGs and a symposium where students presented findings of their research projects to the campus community. Pre-course module and post-course module surveys measured the students' knowledge and perceptions of sustainability. Analyses of student responses revealed that at the end of the course module, the participants demonstrated attaining new academic goals because their knowledge, values and attitudes were positively impacted and caused them to relate better with the content material of the 2030 UNGA: they practised what they had learnt (Eppinga *et al.,* 2020). The findings at Aruba University by Eppinga *et al.* (2020) offered guidance for this study in the design of questions for lecturers and heads of TTIs about how they view SDGs as PCK resources that were worth including in curriculum

practices to prepare PSTs for teaching and integrating ESE into their curriculum planning and teaching practices.

A content analysis of the designations and objectives of degree courses was carried out by Aleixo, Azeiteiro, and Leal (2020) in 33 Portuguese public HEIs, to examine the vertical integration of SDGs as an indicator of the extent to which Portuguese HEIs were integrating SDGs into their curriculum practices. Data were accessed on the websites of the participating institutions. It was found that natural and environmental sciences, as well as social sciences and humanities, were the courses mostly addressing SDGs. A small number of courses, however, incorporated SDGs in a manner deemed as not being explicit enough. The findings of Aleixo *et al.* (2020) offered additional support to the current study as it informed the design of questions for lecturers and heads of TTIs to establish whether or not they view SDGs as PCK resources worth integrating into PST's curriculum practices.

In a case study at UNISA, Mawonde and Togo (2019) explored how a science campus incorporated SDGs in its functions and operations. Data were collected through interviews with campus operations managers and sustainability office personnel. In addition, a survey with Environmental Science Honours students was conducted, as well as observations of what was practised to realise the SDGs. Document analysis was part of the data collection process. Data analysis was carried out by aligning practices with SDG indicators. Findings from this study revealed that UNISA had initiatives which covered most of the SDGs including SDG 4. Even though most UNISA students used the distance education Open Distance e-Learning (ODeL) mode, it was established that the UNISA sustainability community of practice, which consisted of students and staff, is actively involved in promoting sustainable practices as they also participate in the 2030 UNGA. Incorporating SDGs in the functions and operations of an HEI implies that leadership attaches value to them. This is a precursor of effective ESE integration into the wider curriculum community. The findings by Mawonde and Togo (2019) are a clear indication that some HEIs are engaged with the 2030 UNGA. In this study, these findings provided ideas for some questions that were formulated as part of the interview schedules for lecturers and heads of TTIs as it explored how TTIs incorporated SDGs in their functions and operations.

The next section presents ESE mediation in TTIs and explores the combined effect of Education, Sustainability and the Environment on curriculum integration and it attempts to discover how these potentially help to prepare PSTs for teaching and integrating ESE into their curriculum planning and teaching practices.

2.6 MEDIATION OF ENVIRONMENTAL AND SUSTAINABILITY EDUCATION (ESE) IN TEACHER TRAINING INSTITUTIONS DURING THE TRAINING OF PRE-SERVICE TEACHERS

The collective name ESE, as used in this study, combines the concepts of EE, ESD, SE and sustainability. ESD is an educational process of developing human capacity and creativity to equip humankind to live and act sustainably, as environmental and developmental concepts are explained and understood (Kopnina, 2018). Environment, in this context, refers to a social construct in which there is inter-dependability of social, economic and political entities making up the bio-physical world on planet earth. EE is a process engaged in producing people who are environmentally literate, aware of, and concerned about the whole environment in its totality (Palmer, 1998). The SD Commission's definition of SD is one that is given by the World Commission on Environment and Development (WCED) as 'development that meets the needs of the present, without compromising the ability of future generations to meet their own needs' (SDC, 2011:1).

Mandikonza and Lotz-Sisitka (2016), also use the term ESE as a hybrid word combination that emerges out of emphasising EE and ESD to show that environmental, societal, political and economic concerns and challenges are connected. The authors of these definitions show overlaps that confirm the fact that the intersecting concepts of environment, education and sustainability have been applied differently in various contexts. The current study chose to use the collective name ESE because this study principally focused on the environment, sustainability and education in HEIs to determine the extent to which TTIs in Eswatini prepared PSTs for teaching and integrating ESE into their curriculum planning and teaching practices.

2.6.1 Theoretical Literature Study on Mediation of ESE in TTIs during the Training of PSTs

In this study, ESE refers to environmental and sustainability concepts mediated in an educational context. ESE, thus, interfaces aspects of EE and ESD that deal with environmental, economic, societal and political concerns (Didham, 2018). Authors, such as Sund and Lysgaard (2013), use EE and ESD synonymously, arguing that they are overlapping concepts that should collectively be labelled 'Environmental and Sustainability Education', a derivative of EE and SD learning (Sund & Lysgaard, 2013:1). As a professional field, ESE combines ecological knowledge and understanding accompanied by the interplay of ethics, politics and culture in varied settings as humankind relates with the environment on planet earth (De Beer *et al.,* 2016; Irwin & Lotz-Sisitka, 2016).

ESD is concerned with all levels and types of learning to provide quality education that fosters sustainable human development: it includes learning to know, learning to be, learning to live together, learning to do and learning to transform oneself and society. Likewise, ESE thrives on learner-centred, learner-led and learning-led curriculum engagements, which are progressive and transformative pedagogical approaches that are meant to develop students' critical evaluation of alternative perspectives. Such learning-led perspectives are propelled by critical thinking, participatory decision-making, value-guided learning and multi-method approaches that lead to the development of a learner who has the capacity to act for sustainability (O'Donoghue *et al.,* 2018; UNESCO, 2017d). The preceding theoretical literature on ESE points to the fact that, as a learning process and approach, ESE thrives on learner-centred, learning-led curriculum engagements, as pointed out by O'Donoghue *et al.* (2018). This study applied this fact and formulated some of the interview questions to PSTs and lecturers in its attempt to establish what they know and how they practise learning-led teaching and learning.

 ESE offers such avenues as the ones just mentioned for learners to develop their understanding of concepts, surroundings and practices. There seems, however, to be excessive transmission of information and little transacting of learning in the form of participation, self-determination and autonomous thinking. Yet, such instructional forms of teaching and knowledge transfer do not promote the co-creation of knowledge, a key factor in ESE mediation. There is, therefore, an urgent need to

engage in transformative ESE teaching, using alternative teaching and learning strategies that result in the development of SCs (Shumba & Kampamba, 2013).

Many existing publications with theoretical literature on sustainability in HEIs have largely focused on the Global North. Little has been documented about the state of sustainability in HEIs located in the Global South, where Eswatini is located on the African continent. Yet, HEIs in Africa are making considerable progress, especially through research efforts to better understand the prevalent threats to our biosphere (Mohamedbhai, 2012). Despite the increasing focus on sustainability issues in HEIs, both globally and locally, studies on this topic in developing countries remain very scarce or non-existent, and this suggests that there is a paucity of research on sustainability in Africa (Musango & van Breda, 2016). This is affirmed by Lotz-Sisitka (2011) who argued that research has not focused on identifying the positive features prevalent on the African continent.

The following section presents some empirical literature findings useful to this study, literature that underpinned attempts to discover the extent to which PSTs were being prepared to integrate ESE knowledge, skills and attitudes into the Eswatini school curriculum.

2.6.1.1 Sustainability competences (SCs) for effective mediation of ESE in TTIs during the training of PSTs

Competences are a combination of knowledge, ability and willingness in an individual to cope successfully and responsibly with changing situations (Baumert & Kunter, 2013). The term sustainability competences, refers to the combination of cognitive skills, practical abilities and ethical values, as well as attitudes put together for action and self-organisation in various complex contexts and situations. ESD competences, on the other hand, are abilities that teachers and educators need to embed in educational practices in order to promote SCs among their students. SC development influences the way students view sustainable lifestyles in lived experiences. As such, students should be given factual knowledge, as they are simultaneously exposed to opportunities to engage in activities that are collaboratively carried out through multiple perspectives and contexts that enable them to think critically, creatively and constructively. Accordingly, HEIs must develop curricula and pedagogy that will give students the knowledge and skills to develop SCs. Competences can best be

developed by using a combination of pedagogical approaches that go beyond lecturing, as connections are made with sustainability teaching, SCs, and the pedagogical approaches that are used (Lozano, Barreiro-Gen, Lozano & Sammalisto, 2019; Winter, Sterling & Cotton, 2015). The literature on competences provides this study not only with knowledge on how an individual should live sustainably, but also with the need for intentional engagements required to solve problems relating to the environment.

Therefore, embedding sustainability into student learning requires an understanding of the principles of both sustainability and SE so that sustainability literacy and competences may, together, empower students with sufficient knowledge and skills to guide them to act in ways that promote sustainability. Meaningful ESE mediation to help students to acquire SCs requires teaching and learning approaches that involve student-centred, interactive enquiry-based approaches that are intertwined with participatory and inclusive learning processes, trans-disciplinary collaborations and locally contextualised experiential learning (UNECE, 2011).

Four recurring active learning pedagogical strategies that are considered by Tejedor *et al.* (2019) as most relevant for realising SCs among college students are the following: problem-based learning, service learning, case study learning, and simulation learning. Tejedor *et al.* (2019) observed how active learning supported the development of SCs and concluded that there is a need to design and manage learning construction sites that promote active learning. Multiple approaches are needed in order to prepare students to deal with the complexity and uncertainty of sustainability issues. This is in line with what Garrecht, Bruckermann and Harms (2018) note, when they point out that equipping students with the capacity to perform considerable decision-making is a key sustainability competence, because decision-making is required for the processing of information and the implementation of sustainable actions. PSTs in HEIs require careful preparation, as HEIs embrace integrating ESE into their curricula and educational programmes. Professional development initiatives can take various forms that include providing and sharing educational resources to build human capacity among educators. This requires utilising whole-system models that consider change initiatives that are effectively mediated in multiple stakeholder settings operated at many levels (Amado, Dalelo, Adomßent & Fischer, 2017). The interviews with lecturers in this current study

investigated whether or not they shared among themselves educational resources as a learning pedagogical strategy for realising SCs among PSTs. The interviews investigated the level of collaboration among lecturers in different departments in relation to preparing PSTs to learn and teach for sustainability.

Continuous professional development after teacher training must be sustained to achieve the goal of empowering PSTs as implementers of ESD (Brandt, Bürgener, Barth, & Redman, 2019). The capacity of educators, trainers and other change agents must be strengthened for them to become good learning facilitators for ESD (UNESCO, 2014). More and more countries are integrating ESD into their priority areas of teacher education policies and practices. Preparing PSTs as competent change agents compels all HEIs to embrace pedagogies that encourage the development of SCs. Since the sustainability curriculum for PSTs requires CK on sustainability issues, as well as effective teaching and learning formats, PSTs being taught need to have competences that will help them to become competent ESD teachers. It is, however, not clear, whether existing teaching and learning formats support the development of SCs (Qablan, 2018). It is this observation by Qablan, which, during this study's lesson observation schedules for PSTs, compelled the present research to look for practices that promoted the development of competencies among PSTs and the learners whom they taught.

Sustainability awareness is an approach to develop student awareness of sustainability issues and to build associated skills, such as communication and problem solving. Aleixo *et al.* (2020) point out that learning and living can be realised through designing, teaching and learning activities that direct students to be immersed in practical activities that are found in local contexts. In this regard, educators are compelled to redesign teaching and learning resources to incorporate practical activities, preferably those that can be found in lived contexts, which stimulate students to reflect on their attitudes, behaviour and choices. Encouraging sustainable living, through activities that promote cooperation and collaboration, is one way of developing SCs (Wynveen, 2017). Demonstrating awareness of sustainability is an indicator of SC development in an individual. Since SCs have to be developed by the PSTs themselves, this study used carefully designed analytical frameworks, based on an original framework by Nsubuga (2011), for data analysis on SC development that was observed indirectly during lesson observations; this was carried out on PSTs during

their teaching practice as an attempt to discover the type of practical activities during the lessons.

2.6.2 Empirical Literature Study on Mediation of ESE in TTIs during the Training of PSTs

There are areas in HEIs where the concept of sustainability is not fully understood, resulting in the creation of misconceptions and a lack of consensus on the meaning of SD. Filho (2000) interviewed 34 people and discovered that there were misconceptions, as participants considered sustainability to be too abstract and too broad; it lacked personnel to tackle its issues and it demanded huge financial inputs and it lacked a scientific basis. Filho (2000) believes the factors responsible for creating the misconceptions are related to the following: the knowledge background and the quality of training of individuals; their previous experiences with environmental and sustainability contexts; the sustainability perception levels and the existing personal values and the contexts in which people operate – the ecological, economic, political, and social contexts. He further notes that sustainability and sustainable approaches are more than theoretical expressions. He explains that sustainability is too broad to be categorised as a subject. It is a recent field that should be integrated into all disciplines. Addressing various misconceptions to enhance the value of sustainability can be done through research undertakings. HEIs should create contexts where this can occur by providing reliable in-service training and establishing working groups to develop networks to facilitate the exchanging of ideas and experiences (Filho, 2000). His findings on misconceptions about sustainability, prompted this research to formulate questions to students, both in the interview schedule and the questionnaires used to collect quantitative data in order to discover any existing misconceptions. Identifying existing misconceptions was important in this study because it provided a basis for determining factors that enhance and/or hinder the integration of ESE during PST training.

Qureshi (2020) conducted a qualitative study with 38 undergraduate Bio-medical Engineering student participants and used a module he designed to teach sustainability. For a six-week period, students were asked to engage in sustainability living practices of their choice. Their reflective reports that captured their perceptions, feelings and attitudes were later analysed, using descriptive statistics inductive analysis. These reports required students to identify activities in which they

participated so that they lived more sustainably and to explain, not only how the activities were more sustainable, but also how they influenced their behaviour. The results revealed that students engaged in a variety of sustainable living practices, such as recycling, switching to sustainable lifestyles that included cycling and walking, altering consumption habits and engaging in voluntary services in disadvantaged communities.

Learning by sustainability and living to improve sustainability literacy is one such curriculum model that this study sought to investigate. The findings by Qureshi (2020) on sustainability knowledge, sustainability literacy and sustainability lifestyles provided guidelines to investigate, during the content analysis, how much of the content in teacher training curricula was about ESE knowledge and how it could promote the development of ESE skills and, also, which pro-environmental attitudes were included to promote sustainable behaviour among PSTs.

In another activity that was linked to ESE mediation, Moura, Frankenberger and Tortato (2019) carried out an exploratory research task to collect data on sustainable practices that were identified in HEIs in Brazil. They collected and analysed data from 92 carefully selected institutions and they found that 28 offered lectures in sustainability CK that were guided by their course outlines and that had the following topics, among others: energy and sustainability, environmental management and environmental conservation and sustainability practices. There were practices that the Brazilian study found relevant to sustainability activities in social settings that were meant to improve the environment. They included conserving consumable resources, such as water, soil fertility and fresh air, and this was demonstrated by improving the surrounding environment, promoting clean renewable energy sources and improving garbage collection, as well as recycling techniques. This exploratory study confirms that it is possible to align sustainable practices with educational objectives and values, and it implies that meaningful ESE integration can be realised in an HEI with strong environmental policies that encourage striving for excellence in all areas of sustainability. If universities fail to embed sustainability in their daily business, it will not be easy for them to mediate it in their curricula. This current study, supported by the findings of the Moura *et al.* (2019), determines how much of the content in the course outlines related to ESE knowledge could promote the development of ESE skills and which environmentally-friendly attitudes were included to promote lifestyles

that supported sustainability among PSTs. In addition, it investigates whether or not the two TTIs embedded sustainability in their daily business activities, which Moura et al. (2019) consider a precursor for effective ESE mediation.

Wirth, Fuenfschilling, Frantzeskaki and Coenen (2019) point out that sustainability solutions can be discovered by using institutional physical settings such as living laboratories for research to promote sustainability through the exchange of knowledge by applying collaborative and innovative approaches (Leeds Living Lab, 2018). The research work carried out by Purcell, Henriksen and Spengler (2019) and discussed in the following section, illustrates the Living Laboratory concept.

HEIs have been labelled as 'living laboratories', where sustainability experiences could be explored as sustainability is positioned as an aspirational and intentional undertaking. The role of universities, acting as living laboratories, was explored in a multi-case study, involving three universities, Plymouth University (PU) in the UK, American University in Bulgaria (AUB), and Harvard University (HU) in the United States of America (USA). The study that was carried out by Purcell *et al.* (2019) took the form of examining archival materials as a form of document analysis, interviews, observations, visits and lived experiences. The pursuit of sustainability at PU was found to have been well aligned with the 2030 UNGA and was interpreted by the research team as a key catalytic factor in the university community, and beyond, in the pursuit of shared actions for the wellbeing of humankind. The AUB created a living laboratory space to explore creative solutions to a real-world sustainability challenge of good growth. Their activities revealed to senior university leaders the value of human capital and talent in relation to SD being supportive of growth and development of AUB (Purcell *et al.,* 2019). HU used its established research machinery, combined with the teaching spaces, to tackle real-world SDG challenges on- and off-campus with the Office of Sustainability leading initiatives to create a healthier and more sustainable campus community. All three case studies revealed that each university demonstrated a shared purpose within its community to tackle real-life sustainability challenges and that collaboration and co-creation processes were mediating factors, helping to bring about a protracted cycle of experimentation, prototyping and testing. The researchers noted that systems thinking by university leaders characterised the approach used to centre sustainability issues so that their interdependence and inter-connectedness could become explicit (Purcell *et al.,* 2019). Since the living laboratory

framework can be generalised to realise transformative institutional and individual change, it should not only recognise and utilise student leadership, but also recognise the input from stakeholders outside the university.

The concept of Living Laboratories was important in this study, because it pointed to the research question of how ESE was mediated in TTIs during the training of PSTs. The Living Laboratory concept guided the present researcher to design some of the interview questions to establish how leaders of TTIs viewed human capital, in connection with addressing sustainability issues. The planning of the observation schedule included observing both the built environment and its natural physical surroundings to establish the extent to which they translated into Living Laboratories that could enhance the integration of ESE during PST training.

In yet another study relating to ESE mediation, Fokdal, Colic and Rodic (2020), in a context of key SCs, analysed students' assessments of a pedagogical model, combined with prescribed LOs. They found that a learner-centred and action-oriented approach supported by a global dialogue among peers of different nationalities and backgrounds was an effective way to educate future generations. This form of mediation, they envisaged, would act as change agents for the transformation of a variety of societies. The same study investigated three programmes in Serbia and Germany and explored their approaches to mediating sustainability in their academic programmes. As a result, data that supported the notion that international cooperation among HEIs can lead to better ESE mediation were generated. In the light of the findings highlighting the value of global connectivity, the current study has included questions in the interview schedule for PSTs to find out whether any of them were networking globally. Lecturers were also interviewed to establish their levels of global connectivity with respect to ESE mediation. Additionally, questions were included to both the leaders of the institutions and the officials from the EEA about their views on global networks and ESE development.

Universities, as HEIs, apply a variety of opportunities to mediate ESE. Many of the approaches relate to practical matters that directly affect campus-lived experiences where practical matters, such as recycling, energy efficiency and green building design, among others, are addressed (Pretorius, Anderson, Khotoo & Pienaar, 2019). It is, however, not easy to find examples in documented literature of the systemic

institutional commitment to increase sustainability engagements in campus operations. In research undertaking at UNISA by Pretorius *et al.* (2019), three undergraduate sustainability-related modules were used in the Department of Geography to gather lecturers' reflective narratives on the teaching-learning experiences of students who were taught using the blended learning pedagogical strategy. Printed materials in form of tutorial letters and textbooks were supplemented with electronic material in form of blogs, e-forums and text messages. In the three modules, continuous formative assessment was used as a driver for sustainability learning as students participated in real-world applications.

In all the three modules, students reported that they found their assessment engagements with real-world contexts to be exciting and beneficial, because of the opportunity to work with sustainability problems through hands-on, minds-on activities. The lecturers perceived the assessment strategies of all three modules to be effective and successful in creating opportunities for real-world sustainability teaching and learning. Even though the assessment tasks just mentioned were carried out in a university offering ODeL, the results can be utilised by other HEIs that have online teaching and learning components in their curricula. The findings by Pretorius *et al.* (2019) provided useful guidelines in this study, which investigated the quality of opportunities that the two TTIs made available to PSTs to address sustainability matters during the mediation of ESE. This was done through document analysis and questions that were included in the interviews to the heads of TTIs, lecturers and PSTs.

For a university to participate in ESE activities meaningfully, it should have institutional framework policy documents that guide its strategic planning, which includes adopting an institutional agenda for SD. The agenda is an expression of the commitment of the entire academic community: the administration, the academia and the students. The policies in place should favour diversity, inclusion and participation to direct the university activities in a manner that allows monitoring and evaluation. To that effect, Paletta and Bonoli (2019) investigated the University of Bologna (UOB) in Italy. UOB has a planning and operative approach operationalised by focusing on innovative methodological models that target measuring management processes and it relies on awareness as common best practices are highlighted and a variety of intergenerational experiences and narratives are compared. The aim of UOB

launching a sustainability programme, called 'UOB Green', was to turn the university into a living laboratory of sustainability experiments in order to implement its Environmental Sustainability plan. The envisaged practices were linked to environmental issues, such as energy-efficiency practices, water conservation, recycling of waste, climate change mitigating measures, green infrastructure adaptability, pollution elimination mitigating measures, sustainable consumption practices, and carbon footprint measurement. UOB documented their experiences, systematically reporting the results of their activities. The present researcher considered the UOB approach essential for ESE mediation, and this study investigated institutional framework policy documents that guided TTIs in the strategic planning to discover if ESE mediation was included.

Another study by Ulmer and Wydra (2020), which was very important for this study, covered 16 African nations, where 32 sustainability experts shared their ESE mediation experiences in their respective HEIs. The topics discussed included the use of local languages, the application of indigenous knowledge and the value of culture in HEIs' sustainability approaches. In this present survey, where Eswatini was represented by two experts, it was discovered that African HEIs were actively engaged in research on climate change and sustainable environment, and, among other research issues, in mainstreaming environment and sustainability by integrating sustainability and environmental topics into HEI academic programmes, in promoting pro-environmental management operations and policies, such as energy efficiency management, conservation of natural resources, including soil and water, recycling and waste management, community service with outreach activities seeking to create links between campuses and their neighbouring communities and in extra-curricular activities mediated through student clubs, councils, and societies. The study by Ulmer and Wydra (2020) highlighted the intrinsic value of language and culture for successful integration of sustainability in HEIs' practices. Their findings also revealed that campus operations in the fields of research, teaching campus operations and community engagement had received equal attention and priority. Attitudinal factors, especially ignorance and resistance towards sustainability, presented the largest barrier to sustainability participation. These findings highlighting campus operations in the fields of research, teaching campus operations, and community engagement were valuable in my study because they guided the investigation on the mainstreaming of ESE

initiatives in TTIs as the research sought to establish how ESE was integrated into courses and academic programmes through document analysis. The study by Ulmer and Wydra (2020) guided the current study in finding out, during the interviewing of lecturers, how the use of the local language, the application of indigenous knowledge, and the value of culture influenced the mainstreaming of ESE initiatives in the TTIs.

Wamsler (2020), in a reflexive case study carried out at Lund University (LU), Sweden, sought to establish a relationship between sustainability and inner transformation. In her study, in which she used an innovative course combining sustainability and the concept of inner transformation, she discovered that inner human cognitive dimensions can be a vehicle for imparting SE. She preferred to use the trans-disciplinary approach that consisted of experimenting and validating new teaching and learning methods with a selected number of university students. Her key aim was to explore contemplative thinking approaches in sustainability teaching and learning with the intention to make them an integral part of the curriculum. Contemplative thinking includes a broad range of meditation practices capable of increasing non-judgemental attentiveness in any given moment.

In Wamsler's (2020) study, contemplative teaching and learning approaches were integrated into mandatory course activities that included the encouragement of mindful interactions during listening, reflecting and working in groups. Students were later required to produce a written reflection on their learning in connection to five key aspects of mindfulness: observing, describing, acting with awareness, non-judgement and reactivity. Written assignments on sustainability and inner transformation were offered as graded tasks. Additionally, contemplative practices that lasted for about 20 minutes were conducted by volunteers outside the usual course activities. The results showed that most of the students were open to including contemplative approaches in sustainability teaching and learning with 80% of the participants welcoming the integration of contemplative approaches into the course. She further discovered that mindfulness had the potential to contribute to understanding and facilitating sustainability, both at individual level and in social learning spaces. Such integral approaches and pedagogies are important in today's educational settings, because they focus on inner dimensions and capacities to facilitate reflection on the cognitive and socio-emotional processes that underpin students' learning, life choices and decision making.

The trans-disciplinary, transformative approach that Wamsler (2020) investigated are new approaches capable of promoting mindfulness that, in ESE mediation, is important for the realisation of learning objectives in the cognitive, socio-emotional and behavioural domains. Exposure to new approaches was an important part of this current study because many authors have pointed out that previous traditional approaches have not worked in favour of ESE. To that effect, the design of the interview schedule for lecturers allowed a discussion for lecturers on the aspect of alternative forms using examples such as those presented by Wamsler (2020).

Mediating ESE in the context of inter-dependability of social, economic and political dimensions cannot take place effortlessly. The call to refocus our attention on how ESE should be mediated is echoed in both theoretical and empirical literature studies. ESE, as argued by Mahmud (2017), is neither a subject area nor a learning area to add to a teaching timetable, but it is rather an approach to teaching and learning. No wonder it is viewed by authors, such as O'Donoghue *et al.* (2018), as a transformative, learning-led experience. The argument underlying the need to find alternative approaches for ESE mediation originates from observations that suggest that the previous EE and ESD mediation efforts have produced unsustainable practices (UNESCO, 2017b). The alternative approaches suggested for effective ESE mediation can best be handled by qualified, well-trained teachers. As such, teacher education and training spaces were another key aspect of this literature study and is discussed to highlight factors enhancing and/or hindering the integration of ESE knowledge, skills and attitudes during PSTs' training.

2.7 FACTORS THAT ENHANCE AND/OR HINDER THE INTEGRATION OF ESE KNOWLEDGE, SKILLS AND ATTITUDES DURING PSTs' TRAINING AT TTIs

Globally, educating and training pre-service teachers involves the initial teacher training that is guided by curriculum programmes, which are prescribed by TTIs; this includes not only the acquisition of CK in the lecture rooms, but also teaching practice. Newly qualified teachers are employed on probation, during which they go through induction programmes meant to support the newly initiated in-service teachers. Once confirmed, they are encouraged to embrace the principle and practice of life-long learning so that they continually develop professionally.

Such preparation strategies for teachers who are joining the work force are promoted and supported through stakeholder partnerships, like education and training ministries, TTIs, and other key supporting agents, such as curriculum material publishing houses. Despite their training, developing pro-environmental values and attitudes in established in-service teachers requires a change in personal convictions. Educators, as well as learners, need to interpret personal experiences as they question their values, beliefs and daily life engagements. Intentional transforming behaviour demands that the knowledge, skills and values, which are part of the process of constructing learning, are valuable, meaningful and relevant to both the educator and learner (Qablan, 2018).

The following theoretical literature study sheds more light on factors that enhance and/or hinder the integration of ESE knowledge, skills, and attitudes during PSTs' training at TTIs.

2.7.1 Theoretical Literature Study highlighting Factors that enhance and/or hinder the Integration of ESE Knowledge, Skills and Attitudes during PSTs Training at TTIs

Little attention has been paid to the quality of teachers and their actions in the classroom; yet, for meaningful learning to be realised, effective teacher engagement is required in all education systems. Key to effective teacher professional development is the need for practicality, specificity and continuity. Pedagogy for sustainability should, therefore, promote the development of SCs with teachers being trained using non-theoretical constructs. Equally important is the necessity for long-term monitoring of in-service teachers in order to ensure that products of research, which contain updated methods and approaches to teaching and learning, are well utilised in the workplace (World Bank, 2018).

Students need to develop competences that are transformative, able to change them as individuals, able to change their teaching and learning, and, ultimately, able to transform whole national education systems in which such students are serving. Such a holistic and transformational type of education can create interactive, learner-centred classroom experiences that are action-oriented and are propelled by self-directed learning, participation and collaboration. Transformative pedagogy, which is key to SC development, draws on the experience of learners and creates opportunities for participation and for the development of creativity, innovation and the capacity to

imagine alternative ways of living. It encourages learners to reflect on the impact of their everyday choices in terms of SD (Giangrande *et al.,* 2019; UNECE, 2011). This paragraph emphasises student learning that empowers a learner. The literature that was mentioned above has guided this study to investigate, through lesson observations, the extent to which PSTs are empowered with the knowledge and the skills to apply action-oriented teaching, which has been pointed out as a good teaching approach for ESE mediation.

Competences that address the cognitive, socio-emotional and behavioural domains of learning in a balanced way, should be promoted in order to achieve transformative action for sustainability at both personal and community levels. The personal dimension of SCs that address individual values, attitudes and lived experiences should be reinforced in HEIs through the conceptualisation and effective application of innovative pedagogical approaches in curriculum practices. Such practices include the design and implementation of evaluation tools to gauge the development of SCs (Dlouhá *et al.,* 2019).

Empirical literature on PST preparation, which includes research findings on SCs, offered guidelines that are applied in this study to identify the specific attributes PSTs need in order to develop action and self-organisation as they are prepared for teaching and integrating ESE into their curriculum planning and teaching practices (UNESCO, 2017a). To develop further understanding of these factors, the following section presents some of these findings.

2.7.2 Empirical Literature Study highlighting Factors that enhance and/or hinder the Integration of ESE Knowledge, Skills and Attitudes during PSTs Training at TTIs

Establishing how PSTs integrate ESE into their curriculum implementation practices in the classroom partly depends on how they develop SCs rooted in experience and action. Sarıkaya and Saraç (2018) found PSTs to have a positive attitude towards the environment, despite their inability to participate willingly in activities aimed at tackling environmental issues. The PSTs in the study by Sarıkaya and Saraç (2018) admitted unwillingness to change their lifestyles for the sake of the environment, even when their levels of knowledge about the environment were highly rated. They also failed to link the use of resources with the effects such resource exploitations had on the environment.

Similar evidence from research findings of Álvarez-García, Sureda-Negre and Comas-Forgas (2015) reveal a lack of environmental competences among PST students who appeared knowledgeable on sustainability matters. There appeared to be a disconnection between what the students were practising and the official curriculum policies guiding their practices. Moreover, Álvarez-García *et al.* (2015) point out that there is a scarcity of documented research data in the area they studied as they argue for curriculum restructuring to embed SCs. They further advise that graduating PSTs should be evaluated to determine the extent to which they can mediate ESE in their professional teaching careers, and they recommend that teaching and learning should be carried out in contexts that promote practical and experiential ESE mediation. The findings by Sarıkaya and Saraç (2018), as well as those by Álvarez-García's (2015) team of researchers, contained useful advice that has been applied in this study. Their advice offered guidance as this research designed the lesson observation schedules for the PSTs to identify contexts that promoted practical approaches to ESE mediation.

Pasin and Bozelli (2016), in another research undertaking, found that the majority of PSTs with whom they interacted had not only restricted the meaning of EE to conservation and preservation, but also had difficulty linking EE and socio-economic matters in that they could not contextualise EE with social, economic, ethical and cultural issues. This observed restriction could partly be a manifestation of what is taking place in the PST preparation practices, in which it has been indicated that traditional teaching methods are still widely applied in all subjects (UNESCO, 2017b). Prompted by this finding, in the interview schedule designed for PSTs in the current study, questions to gauge PSTs' understanding of EE and ESD in the context of social, economic, ethical, and cultural issues were included.

In a study to compare environmental attitudes and pro-environmental behaviour, Swinkels, Koopman, and Beijaard (2013) found that positive environmental considerations of PSTs did not correlate positively with their pro-environmental behaviour. Their 2013 study concludes that positive attitudes towards the environment do not necessarily translate into pro-environmental behaviour, as far as PSTs are concerned. Swinkels *et al.* (2013) further point out that institutions that train PSTs can best respond to EE and ESD, if educators and policy makers at grassroots, national, regional and international levels are capacitated. Of equal importance is that improvements in educating and training PSTs should focus on enriching learning

content and facilitating the transfer of knowledge and skills to ensure that learning spaces fulfil their functional roles in the mediation of ESE. The work of Swinkels *et al.* (2013) supported the structuring of the questionnaire used in this study to include questions that elicited respondent information to reveal whether or not they had pro-environmental attitudes and whether these attitudes correlated with their pattern of behaviour towards the environment. During lesson observation, which was carried out as part of this study, the research investigated how the attitudes PSTs acquired are applied in their curriculum practices.

Project Oriented Learning (POL), a competency-based learning approach, is an appropriate and effective method for developing competencies in sustainability. It is an instructional approach that supports active learning where students work co-operatively in small groups to research and solve real life problems. The knowledge they accumulate should be accompanied by a demonstration of behavioural patterns that are consistent with what was taught. This competency concept amounts to integrating knowledge, skills and attitudes and acquiring the capacity to find solutions as problems are solved in various tasks (Albareda-Tiana, Vidal-Raméntol & Fernández-Morilla, 2018). The findings of Lambrechts and Van Petegem (2016) confirmed what Albareda-Tiana *et al.* (2018) noted about competency-based learning activities in HE. Lambrechts and Van Petegem (2016) also found that POL methodology was suitable for the development of competencies in sustainability, adding that engaging in research not only supported the development of research competencies, but also the development of SCs when they were both carried out in the same research context.

These findings on learning activities are a challenge to both PSTs and the lecturers that prepare them for the field of work. As part of this study to establish the extent to which TTIs in Eswatini prepared PSTs for teaching and integrating ESE into their curriculum planning and teaching practices, this research sought to establish whether competency-based learning activities were promoted during teacher training. It also investigated PSTs to determine whether competency-based learning activities, with or without POL components, formed part of their curriculum practices and, if so, how they had developed these practices. Information from both PSTs and their lecturers was collected during interviews and lesson observation schedules.

Likewise, Fuertes-Camacho, Graell-Martín, Fuentes-Loss and Balaguer-Fàbregas (2019) consider the global learning strategy through the project method to be an important way of improving students' SCs. They conclude in their findings that SCs of PSTs can be enhanced using an integrated approach where teaching and learning is mediated to promote knowledge, skills, values, and attitudes. They further elaborate that SCs are of a more individual nature, despite being closely related to competencies for SD. Furthermore, they point out that both competencies equip people with life orientation skills to adapt lifestyles that support a balance between economic gains, environmental integrity, and justice in society. Integration is a key aspect of this study and it is a global learning strategy demonstrating a good curriculum approach. Therefore, during the document analysis of course outlines used by the TTIs, the researcher investigated whether project work formed part of the teaching and learning experiences of PSTs.

In another set of empirical literature findings, Togo (2009) noted that students are not merely recipients of EE and ESD, but also, potential change agents within the discourse and practices linked to ESE. She further identifies agency as the main causal factor that enabled Rhodes University (RU) students to engage in sustainability activities. She adds that the student agency in ESD worldwide has been demonstrated, as students have initiated activities to deal with climate change and on-campus activities to deal with environmental challenges and promoting conservation, among others. Togo (2009) conducted a study to verify the extent to which students demonstrate their potential as change agents as they demonstrated SC development by engaging in sustainability activities. She collected data using the Unit-Based Sustainability Assessment Tool, which she had developed as part of her research work to identify sustainability initiatives at RU. Additionally, she conducted interviews and carried out observations and document analysis, from which she obtained qualitative data that led to her discovery that there were many SD projects initiated by RU students, both on the campus and during community service outreach engagements outside the campus. The student-initiated activities at RU included environmental societies made up of student groups, community outreach sustainability activities, recognition and participation in environmental day celebrations and establishment of awareness programmes, such as those aimed at energy saving and carbon footprint reduction and researching on sustainability issues beyond RU.

The empirical study findings on students as change agents, as presented by Togo (2009), were useful for this study because they highlight the practical value of developed SCs in a student. As such, part of the qualitative data collected in this study related to establishing whether PSTs willingly participated in community outreach. The interview schedule for PSTs included questions to determine their levels of participation in project work and community outreach programmes. The research also included questions eliciting information about their participation in any campus or off-campus organisation that promoted 'green activities'.

Student teachers' competence development in ESD is very important. Brandt, Bürgener, Barth, & Redman, (2019) provide evidence on which teaching formats and learning formats help to foster SCs in teachers. Two courses, one dealing with CK and another one with PCK, were taught to the same set of PSTs. The case study design at Leuphana University used a mixed-methods approach combining surveys, focus groups linked by online audio-video support programmes and assessment tools. Analysis of data was carried out, using content analysis for qualitative data and descriptive statistics combined with paired sample t-tests for quantitative data. The results from the study indicated that the two courses enriched the PSTs' knowledge and fostered the development of SCs.

The study at Leuphana University provides evidence that different learning settings support different dimensions of teachers' professional action competence in terms of ESD, and it suggests that competence development appears to be more of a continuous learning process. As such, students should be provided with opportunities for systematic and holistic competence development in recurring courses throughout their PST training. On account of this observation, I interviewed the dean of institution TA, as well as the principal of institution TE, to elicit their views on community outreach, global networking and international organisations such as MESA; this was meant to discover how institutional administration structures supported ESE mediation efforts. The findings from the two courses at Leuphana University were an eye opener that offered guidance during the analysis of course outlines to establish whether learning opportunities for systematic and holistic competence development were present in teacher training programmes offered at TTIs in Eswatini. Preparing PSTs to learn and teach for sustainability means preparing them for a transformative experience that turns them into change agents, as they progressively develop SCs

that are, in part, realised during the teaching practice experiences discussed in the following section.

2.8 INTEGRATION OF ENVIRONMENTAL AND SUSTAINABILITY EDUCATION INTO CURRICULUM PLANNING AND LESSON PRESENTATION IN THE CLASSROOM DURING TEACHING PRACTICE

The process of integrating ESE into HEIs should be a representation of the expressions of what ought to be experienced in the teaching and learning processes. In view of this, relevant content material that is introduced in curriculum structures should yield interconnections characterised by common concepts, values, and skills (Bernstein, 1990; Carl, 2010).

2.8.1 Theoretical Literature Study exploring the Integration of ESE into Curriculum Planning and Lesson Presentation in the Classroom during Teaching Practice

Quality teaching and learning experiences depend partly on locally contextualised relevant curricula, which is operationalised in settings that are safe, secure and user-friendly. More still, existing curricula frameworks require integration to improve CK, PCK, pedagogical practices, curriculum resources and curriculum practices in the classroom. As such, a holistic and coherent curriculum approach can best be realised if it is underpinned by research findings to guide the process of aligning curriculum content and curriculum assessment (Loubser, 2011; World Bank, 2018). At the beginning of this research journey, the researcher had it in mind that, for any reform proposals to be accepted, they would need to be underpinned by evidence guided research on which the EMoET relies.

Curriculum integration has the potential to promote experiential learning encounters, such as active participation in environmental activities and proactively taking care of nature. These, in turn, contribute to the development of pro-environmental values and attitudes that enhance the teaching and learning of environmental issues (Sarıkaya & Saraç, 2018). Essentially, curriculum reforms need to be guided by research that informs education systems of existing gaps and needs. Such research findings, as those that affect ESE, are, therefore, required in diverse contexts, like education and training, authorities, academia, workplaces, and, even, the marketplace. This is the main reason why curriculum integration formed the major thrust of this study, more so

because EMoET periodically requires that research findings guide their curriculum initiatives (Eswatini Government, 2018).

HEIs seek to implement sustainability by focusing on supporting environmental literacy, developing the curriculum and increasing research engagement; all of these are carried out in partnership with government, non-governmental organisations and other key stakeholders, such as the EEA. As such, there is need to incorporate sustainability ideas into the policies, the planning as well as the administration of tertiary institutions, and, even, into the curriculum research and community service in the context of the students' life experiences (Sánchez *et al.,* s.a.). The holistic approach to curriculum implementation calls for the inclusion of related multiple perspectives of content that are contextually environmental, social and economic, but it is important to know that often social and cultural factors can trigger environmental problems. Essentially, holism connects the environmental, social and economic dimensions of SD, integrating their past, present and future implications with their global, regional and local contexts (Boeve-de Pauw *et al.,* 2015). The current study investigated the development of environmental literacy by including some interview questions to the heads of the two TTIs to establish the extent to which sustainability ideas had been incorporated into their administrative, as well as their curricula practices.

According to Johnson (2009), integrating transformative sustainability curriculum initiatives, as an attempt to step outside curriculum spaces, which are characterised by a steepened emphasis on curriculum alignment and subject insulation, is good for ESE. Moreover, she emphasises urgency as well as opportunity and she reminds us of the challenges that should compel humankind to act now to safeguard our own survival and that of future generations. The curriculum in its current state, she adds, is too slow in its operatives and, as such, is incapable of preparing learners quickly enough in a rapidly changing world. She further decries the misalignment between policy and practice and cautions that no significant changes in education practice can be realised if an inappropriate curriculum policy is in place. She then emphasises that we cannot solve environmental problems with the same education system, which is blamed for reproducing and propagating the very same problems. Indeed, society should be presented with a critical reflection on the failings in its biosphere activities. Such reflection can be done by education systems that promote greater awareness,

exploring and inventing new techniques and educational tools (Johnston, 2009). This study in part attempted to present the critical reflection that she pointed out. Some of the interview questions presented to the vice-chancellor and the two heads of the TTIs, as participants in this study, were formulated to establish the alignment of policies and practices. This, in turn, guided the discussion during the investigation into how the three leaders viewed the education system, including existing curriculum policies.

The preceding paragraph shows that ESE deserves more than just integrating randomly selected topics into the mainstream of curriculum practices. The teacher education curriculum programmes should, essentially, be creating epistemic spaces for teachers to discuss ways of knowing, as well as critically reflecting on, how best to evolve as good educators of disciplines whose background touches all subject areas (Hart, 2010). On that account, the convergence of the environmental, social and economic spheres, in conjunction with blurring the insulating boundaries among the subjects that are taught, is a proper teaching and learning strategy for effective EE and ESD implementation (Bernstein, 1990). With this convergence, HEIs would reposition themselves as agents of change, actively co-creating knowledge with other key stakeholders in education systems (Wals, 2013). The current study investigated the insulation of subjects to establish whether the two TTIs had adequately positioned themselves as agents of change so that they were able to create epistemic spaces to tackle ESE issues, as they prepared PSTs. This investigation included some interview questions to the lecturers.

The characteristics of teaching and learning that have just been presented in the theoretical literature helped this study to interpret the proceeding empirical research findings that highlighted the role and the influence of individuals attempting to integrate sustainability in different educational settings in HEIs.

2.8.2 Empirical Literature Study exploring the Integration of ESE into Curriculum Planning and Lesson Presentation in the Classroom during Teaching Practice

Whereas the empirical literature study presented here uses the word 'sustainability' much more frequently than the word 'environment', the purpose of this study was to establish the extent to which PSTs were being prepared to integrate ESE knowledge, skills and attitudes into the Eswatini school curriculum. The reason for this is that the integration of environment and development concerns was part of Agenda 21, the

policy that was designed to implement sustainability in and for the 21ˢᵗ Century (Leicht, Combes, Byun & Agbedahin, 2018). In other words, the aspects dealing with the environment are more often dealt with during the implementation of sustainability. In this study, the two concepts, sustainability and the environment, have been treated equally.

It is also noteworthy that the level of integrating sustainability concepts ranges from policy formulations to integrating courses, curricula and extra-curricular activities to realise a total reform of an educational system (Sammalisto & Lindhqvist, 2008). Hence, it was critical to understand how academia of HEIs integrated and implemented sustainability aspects in their local teaching contexts. Although the empirical literature study highlights many university's academic programmes attempting to mainstream sustainability issues into their curriculum practices, a few sustainability curriculum models are presented that advocate transdisciplinary, transformative and participatory active learning processes. This study considered these three learning processes as key to supporting the preparation of PSTs for teaching and integrating ESE into their curriculum planning and teaching practices. As such, it ensured that they were included as aspects that were observed during lesson observation schedules for PSTs, as they were conducting their teaching practice exercises. The empirical research findings are presented from six studies.

The first study on EE and ESD integration reviewed the characteristics of existing sustainability curriculum models in formal education curriculum structures and teaching methods in four curriculum models that were used in Spain, the USA, and the UK. The analysis involved reviewing complexity of knowledge, flexibility, and permeability of subjects, contextualisation, prospective orientation and curriculum theory and practice comparison. The teaching aspects that were considered included authentic learning spaces, reflexivity, mutual learning and learning by research. The 'ACES' curriculum model that was used by Girona University in Catalonia Spain emphasised greening the curriculum, where students participated in out-of-school-time project-led curriculum experiences. Learners were impacted by increasing their levels of environmental literacy, whereby a green curriculum mainstreamed environmental issues in all institutional activities to promote transdisciplinary awareness that was grounded in local contextual experiences, which were socially constructing knowledge (Woo, Mokhtar, Komoo & Azman, 2012). Curriculum models,

as they pointed out, require proper selection for effective curriculum integration. Therefore, in my study, during the interviews with lecturers who prepared PSTs I Eswatini, aspects of curriculum models were explored, as well as subject-disciplinary patterns in the contexts of the participating lecturers' experiences in order to establish how they influenced the preparation of PSTs for teaching and integrating ESE into their curriculum planning and teaching practices.

The Global Seminar (GS) Curriculum model at Cornell University in the USA covered close to 50 globally networked HEIs and used online communication facilities and techniques to figure out the solutions to environmental issues. Woo *et al.* (2012) found that the GS model participants demonstrated a shift in their views towards focusing more on EfS. This observed transformative nature of GS is attributed to the participatory and constructive processes that underpinned its functionality as a mutual learning model. Its transdisciplinary nature allowed for easy access to different subjects. There was, therefore, the integration of ideas at both local and international levels so that the enriched diversity of participants might increase the depths of understanding of complex sustainability issues that were mediated via online platforms, such as emails, live chat rooms, and video conferences, among others. Technology enabled participants to analyse many case studies shared online, where educators, as facilitators, supported student-centred and student-led learning experiences (Woo *et al.,* 2012). The literature on transformative practices mentioned in the GS curriculum model provided this study with guidelines to investigate, through some of the interview questions put to lecturers, how online platforms were being utilised by TTIs to help PSTs to acquire knowledge, skills and attitudes in their curriculum planning and teaching practices in Eswatini.

The Sustainable Construction Curriculum Design model was developed in the UK by Liverpool John Moore University as a project-based model that stressed integrating real life case studies in curriculum design. It helped to develop action competences and relied on research skills to solve environmental problems and to apply analysed data to develop pro-environmental values and attitudes (Woo *et al.,* 2012). The research practices analysis, which explored four curriculum models applied in different curriculum settings, provided relevant empirical data for this study. This data provided this study guidelines for constructing reliable and valid indicator frameworks that were components of analytical tools that were used during qualitative data analysis. Part of

the data helped to determine criteria that formed the basis for judging ESE integration into curriculum planning and lesson presentation in the classroom during teaching practice. The details of the indicator frameworks, guided by Bernstein's classification scale, are given in Chapter Five of this study.

The second study on EE and ESD integration explored integrating LOs into existing curricula to balance cognitive, psychomotor and affective domains. Sipos, Battisti and Grimm (2008) found that HEIs, whose programmes and courses included these three domains, exhibited the emergent property, referred to as Transformative Sustainability Learning, a useful pedagogy that supports personal and societal transformations to sustainability. SE should be used to deconstruct and reconstruct as many aspects of teaching and learning as possible in HEIs. Sipos *et al.* (2008) explored learning experiences at the University of British Columbia, Vancouver, Canada, and focused on students who practised participant perspective transformation as it takes place in groups. They found the following pedagogies to be relevant to the integration of ESE: critical emancipatory pedagogy, action learning, community service learning, participatory action research, problem solving and traditional ecology knowledge. When these pedagogies are viewed as insulated constructs, the narrow focus stands in the way of a true transformative teaching and learning experience (Sipos *et al.,* 2008).

Since successful integration of ESE into the curriculum planning and teaching practices of PSTs was the whole focus of this study, empirical data emphasising integrating LOs to balance cognitive, psychomotor and affective domains provided a basis for formulating some of the questions that were used in the face-to-face interviews with lecturers and PSTs. In preparing a lesson observation guide, this research ensured that it evaluated the LOs to analyse how cognitive, psychomotor, and affective domains were addressed.

Not only are HEIs attempting to integrate sustainability principles into their activities, but many are also attempting to discover ways ESD can effectively transform their communities.

The third study was an illustrative case study that was conducted in Germany at the Hamburg University of Applied Sciences (HUAS). The ESE context practised at HUAS was that of the theme of applied sustainability as an approach and a lived experience.

This integration approach is fuelled by a desire among students to realise measurable tangible results, as they emphasise employing sustainability principles in practical situations that include lesson presentation during teaching practice. The HUAS case study revealed that integration can be achieved through a holistic approach characterised by corporate strategic planning across existing professional domains (Filho, Shiel & Paço, 2015). The HUAS success story is attributed to the close links that the agents of change, the environment, and those that manage specific aspects linked to sustainable living have with each other.

The illustrative case study carried out at HUAS presents a challenge to the more traditional, theoretically-oriented universities to invest both time and effort to establish sustainability profiles, where all professionals are included, discipline boundaries are blurred and inter-faculty collaboration is promoted. Such institutional willingness to strengthen internal capacity to integrate ESE with a framework that encourages policy implementation driven by research helps to sustain change in communities (Filho *et al.,* 2015). This third study that formed part of the empirical findings of this present research highlighted community outreach and challenged traditional practices that in most cases deal with sustainability issues at theoretical levels. Guided by the findings of Filho *et al.* (2015), interview questions were designed for the three heads of institutions in an attempt to establish the extent to which TTIs in Eswatini prepared PSTs for teaching and integrating ESE into their curriculum planning and teaching practices.

The fourth study was carried out by Burns (2011), who presented a sustainability living curriculum model consisting of five dimensions; namely, content, perspective, process, context and design. These five dimensions are used to facilitate transitioning from transmissive teaching models to transformative learning processes. Creating opportunities for TSL is characterised by the following: increasing students' systemic understanding of complex sustainability issues aimed at reinforcing their CK; presenting diverse perspectives to students by providing learners with opportunities to think critically on issues that influence their learning spaces; imparting process skills to equip students with active learning competences; contextualising students' learning with lived experiences; and intentionally designing transformative learning experiences that ultimately translate into sustainable lifestyles. Educators are expected to develop students' knowledge of subject matter and to use relevant themes

that promote participation at multiple dimensions. The curriculum model presented by Burns in part provided building blocks that this research used to design analytical frameworks and to analyse the data collected during the lesson observations for PSTs. The details of the frameworks are given in Chapter Five.

The fifth study by O'Donoghue *et al.* (2018) was carried out in Southern Africa, the region where this study took place. It focuses on changing teaching and learning environments by applying course-activated, learning-led teaching techniques. With this approach, emphasis is placed on pedagogy and sustainable campus management underpinned by inclusive governance that values cooperation with partners and broader curriculum communities. These learning-led dimensions surrounding education and training practices are emerging as learning construction sites characterised by participatory knowledge exchange experiences. Learning-led change is realised, as collaborating participants uncover and resolve conflicts and contradictions in their lived contexts. Central to learning-led participatory teaching is the emerging capability of learners to bring about change (O'Donoghue *et al.,* 2018). The literature on emerging practices provided this study, not only with knowledge on new educational initiatives, but also with guidelines that challenged existing practices by lecturers. Some of the interview questions that were presented to lecturers explored how existing practices prepared PSTs for teaching and integrating ESE into their curriculum planning and teaching practices, and they compared (and contrasted) existing and emerging teaching approaches.

One of the studies that O'Donoghue *et al.* (2018) explored at Rhodes University (RU) highlights course-activated learning that focused on shaping and sharpening participant action competences. The course-activated social learning in part focused on rainwater harvesting in the Eastern Cape, South Africa. In this study, expert knowledge in the practical application of resources on rainwater harvesting and the local knowledge of participating partners were infused to realise a co-engaged learning process that benefited the community in the area of ensuring food security. The harvested rainwater was used in a teaching garden that illustrated intergenerational water conservation practices and modern drip irrigation. The attempt by RU students to change the ESD education and training environment is a shift away from traditional approaches to situated, co-engaged, participatory and inclusive learning in a whole institution context. In such an approach, situated relevance is contextualised and

located at grassroot level to meet needs, while promoting sustainability lifestyles. Learning is led by values that guide actions to ensure that what is undertaken, is sustainable (O'Donoghue *et al.,* 2018).

In the search to establish the extent to which TTIs in Eswatini prepared PSTs for teaching and integrating ESE into their curriculum planning and teaching practices, this researcher was keen to establish how SCs were developing among PSTs. The current study used this fifth study as a guide to develop some of the interview questions for lecturers as it investigated SCs in relation to the way course content addressed preparing PSTs for the classroom teaching. How PSTs carried out their teaching to include new approaches, such as course-activated social learning, is an important part of this study.

The sixth set of empirical data that was helpful in this study was that of Mateus *et al.* (2020), whose research investigating Project Based Learning (PBL), a learning approach that seeks to accelerate integrating sustainability principles in an HEI's curriculum programme. This set of empirical data on EE and ESD integration provided guidance to this study as it investigated PBL during lesson observations which were carried out in the TTIs to determine the extent to which TTIs in Eswatini prepared PSTs for teaching and integrating ESE into their curriculum planning and teaching practices. Students of three different curriculum programmes at the Polytechnic Institute of Tomar, Portugal participated in a sustainability-oriented applied-research project that sought to improve the design, operation, and sustainability of constructed wetlands.

The study found that the students' contribution in the research tasks directly benefited their academic work as they acquired skills and developed SCs that they demonstrated in a variety of ways. In this approach, sustainability issues were included as part of PCK in the university curriculum documents. PBL approaches are thus promoted as an alternative way of teaching and learning that overcomes barriers to the integration of new curriculum material in HE curricula, especially where sustainability content is not available in the courses offered. These findings by Mateus *et al.* (2020) guided this current study while it investigated whether or not applied research using PBL approaches that promoted transdisciplinary practices existed as part of preparing PSTs in Eswatini for teaching and integrating ESE into their curriculum planning and teaching practices (Mateus *et al.,* 2020).

2.9 ENVIRONMENTAL AND SUSTAINABILITY EDUCATION: ESWATINI CONTEXT

The current study research found that previous research work on EE conducted in Eswatini, recommended that TTIs needed to work closely with national curriculum policy implementers to ensure that PSTs were properly trained to mediate EE and that environmental bodies, such as EEA, should closely participate in the professional development of qualified teachers. It also added that the movement towards valuing learning was emerging in a networked formation, in which, according to Ainsworth and Eaton (2010), professional organisations were expected to set standards and to facilitate dialogue, collaboration, and professional development (Kyamogi, 2017). The current study, which is seeking to establish the extent to which PSTs in Eswatini were being prepared for teaching and integrating ESE into their curriculum planning and teaching practices, is essentially an attempt to implement the recommendation that was made in 2017.

In searching existing academic literature records, there were very few Eswatini reports of empirical studies focusing on sustainability. Four of them are presented here.

Agbedahin (2017) focused her research work on ESD in HEIs. At the UNESWA, she found evidence of personal professional development of lecturers who had been supported by senior management and administration. Nevertheless, she neither focused on the status of sustainability in relation to the university students, nor on how ESE practices could have benefited from the professional development that was observed to have occurred.

Murye (2017) investigated an environmental and socio-economic sustainability reality – the harvesting of Marula fruit in Eswatini. Again, his valuable findings, though good for sustainability, do not directly address ESE issues.

Two earlier research outputs of 2014 that are loosely related to the integration of ESE into curriculum programmes in Eswatini are available. The first is about EE inclusion in the High School Agriculture Curriculum in Eswatini and the second is on aspects of EE implementation in the Geography curriculum in Eswatini schools (Eswatini Government, 2015).

2.10 THE RESEARCH GAP

The scope of most of the existing literature studied that was carried out in Eswatini is limited to EE and Environmental, Sustainable Development and Management. The protracted interest in this study stemmed from the lack of empirical data addressing PSTs' preparation to teach and integrate ESE knowledge, skills and attitudes into the Eswatini school curriculum. This is the research gap that this study has sought to bridge as it has investigated the extent to which PSTs were being prepared to integrate ESE knowledge, skills and attitudes into the Eswatini school curriculum.

This research gap was partly alluded to by researchers, such as Mahmud (2017), Didham (2018) and O'Donoghue *et al.* (2018), among others, who recognise the need to strengthen understanding of EE and ESD in HEIs so that it may be mediated, using recommended approaches. They further point out that there are very few comprehensive studies that have been carried out on EE and ESD to create a better understanding of ESE mediation in African educational contexts. The overall picture presented is that ESD is poorly researched and weakly evidenced (UNESCO, 2011).

There was, therefore, the need to provide empirical data on the extent to which PSTs were being prepared to integrate ESE knowledge, skills and attitudes into the Eswatini school curriculum. Álvarez-García *et al.* (2015) and Musango and van Breda (2016) added their voices noting that it was not easy accessing data on ESD curriculum processes, because most were not documented. Indeed, only a few documented sustainability, lived experiences included Eswatini. This present research is based on the need to engage in an in-depth exploration and understanding of EE and ESD; this is against the background of what the literature study highlighted as changes required to transform the learning experiences and processes of PSTs as a solution to up-scaling the quality of trained teachers referred to in target 4c of SDG 4. The approaches for effective ESE mediation that are recommended by a number of authors in the literature presented in this study, which include transformative, learning-led, and action-based exploratory teaching and learning, can be supported by empirical research findings, such as the ones generated by this study.

2.11 CHAPTER SUMMARY

This chapter contains a study of literature detailing contextual settings within which PSTs in Eswatini TTIs are being prepared for teaching and integrating ESE into their curriculum planning and teaching practices. The chapter comprised of six sections that categorise the literature that was studied. The first section presented a brief history of EE and ESD. This was followed by a discussion on the training of PSTs in ESE knowledge, skills, and attitudes. The third section focused on the integration of SDG 4 into the teacher training institution's curriculum. The fourth set of literature presented the mediation of ESE in TTIs during the training of PSTs. The fifth category of literature highlighted factors at TTIs that enhance and/or hinder the integration of ESE knowledge, skills, and attitudes during the training of PSTs. The sixth set of literature selected for study referred to the integration of ESE into curriculum planning and lesson presentation in the classroom during teaching practice. The last part of the chapter gives a brief explanation of the Eswatini context of ESE and then it highlights the research gap.

The next chapter looks at the theoretical and conceptual perspectives that informed this study. It takes into consideration the ideas and views advanced in the literature study presented for this study.

CHAPTER THREE
THE THEORETICAL AND CONCEPTUAL FRAMEWORK

3.1   INTRODUCTION

The purpose of this chapter is to present the Theoretical and Conceptual Frameworks for this study. The first section provides a detailed account of three theories that are applied in this study. The theories that are illustrated in Figure 3.1 below consist of constructivist theories of learning, Bernstein's Concepts of Classification, Framing, and Curriculum Re-contextualisation and Rogan and Grayson's Theory of Curriculum Implementation. The theories were adopted to provide not only a lens through which the development of ESE knowledge, skills and attitudes that PSTs acquired in TTIs could be accounted for, but also a framework for analysing findings from this study regarding the extent to which TTIs in Eswatini prepared PSTs for teaching and integrating ESE into their curriculum planning and teaching practices.
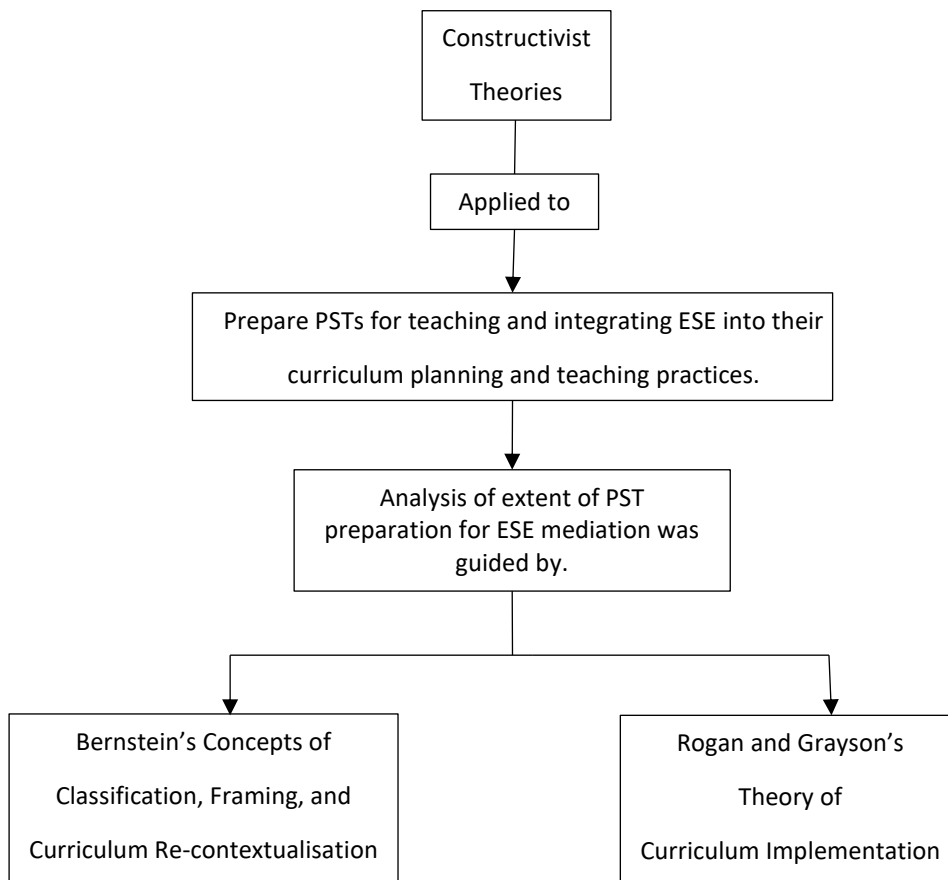
Figure 3.1: A mapping of theories which underpinned this study

The second section consists of the Conceptual Framework, which highlights the relationships of different components of the main concepts that shaped this study. The four concepts shaping this study are illustrated in Figure 3.2 below. This study is about PST education in TTIs in Eswatini, with a focus on curriculum practices in ESE integration to establish the extent to which TTIs in Eswatini prepare PSTs for teaching and integrating ESE into their curriculum planning and teaching practices – a manifestation of ESE curriculum implementation. The key concepts in this study are Environmental and Sustainability Education, Curriculum Integration, Pre-service Teacher Education, and Training and SCs.
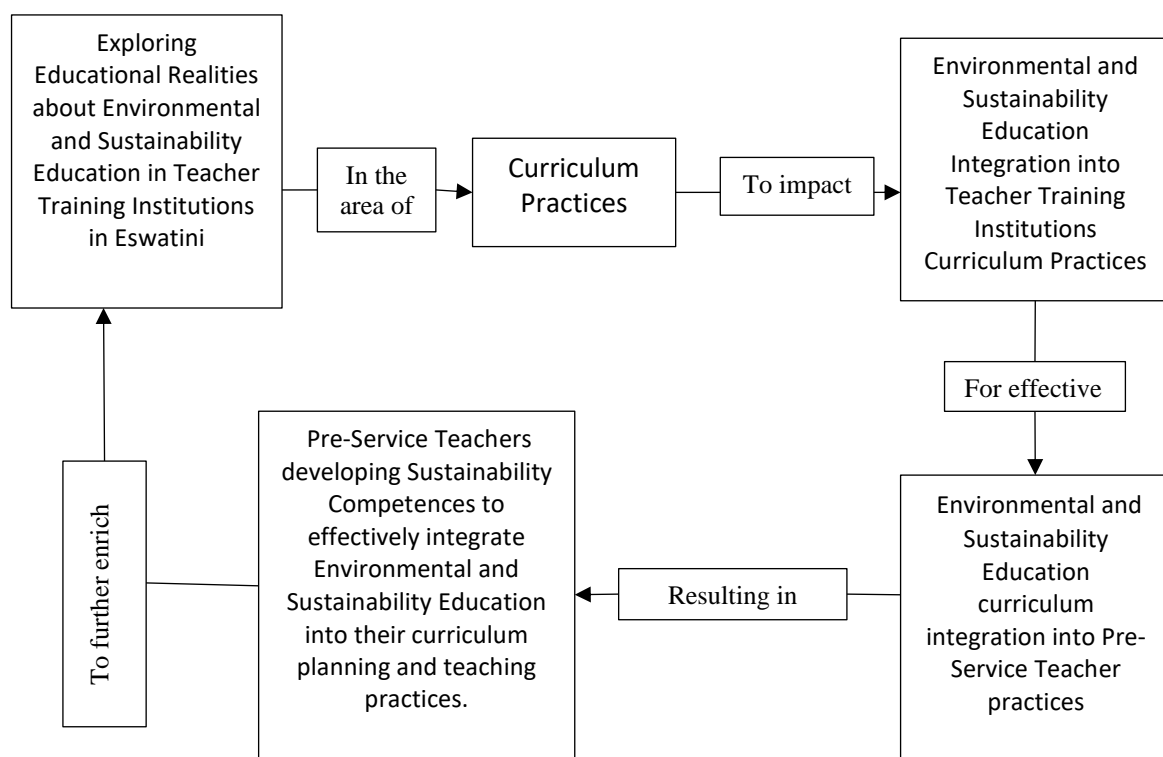
Figure 3.2: The conceptual map of this study

3.2   THEORETICAL FRAMEWORK

Theories used to build a framework are explanations that are described by Cohen et al. (2018) as statements, suggestions or propositions that bring together concepts into a functional coherent framework. The theoretical framework for this study enabled the comparison and analysis of empirical data by offering explanations and predictions on how knowledge, skills, and attitudes PSTs acquired in TTIs were applied in their curriculum practices.

3.2.1 Constructivism

The secret of true education is not determined by the knowledge that learners acquire, but by how they acquire it. This requires a unique professionalism that facilitates learning and that is grounded in promoting excellence in learning quality within a social, moral and ethical consciousness (Slabbert, De Kock & Hattingh, 2009). In order to establish the extent to which TTIs in Eswatini prepared PSTs for teaching and integrating ESE into their curriculum planning and teaching practices, this study adopted the Theory of Constructivism as part of the Theoretical Framework for this study, and this decision is based on the literature that was studied and presented in Chapter Two and that explicitly indicates the need to construct ESE knowledge in authentic contexts. For example, Avery and Nordén (2017) speak of intellectual pluralism, Qablan (2018) speaks of redirecting the teaching and learning approaches by replacing traditional curriculum practices, and Stevenson (2007) is explicit about constructing learning when he argues for the creation of learning construction spaces to engage learners meaningfully in ESE experiences. The theory of constructivism is illustrated in Figure 3.3 below.

Constructivism, as a theory of knowing, is based on the idea that people construct their own understanding and knowledge of the world around them through experiencing things and reflecting on the different experiences. Learning is viewed as a personal interpretation of the world that leads to knowledge construction that is mediated through active processes based on prior experience. Co-creation of meanings involves problem solving and understanding, the use of complex, relevant, and realistic environments, socially negotiated learning, multiple perspectives and multiple modes of learning, and ownership in learning and metacognition. Everyone's individual experiences make their learning unique to them. They 'learn to learn as they learn', meaning that each item they learn gives them a better understanding of whatever else is later encountered (Driscoll, 2014; Woolfolk, 2016).

This study uses constructivism as its theoretical lens to explore how ESE knowledge, skills and attitudes are acquired by PSTs in Eswatini TTIs, while they are being prepared to teach and integrate ESE into their curriculum planning and teaching practices. Constructivism is considered as a relevant episteme in this study and is based on the fact that the reviewed literature presented in Chapter Two suggests that

the best forms of ESE mediation are characterised by problem-solving activities, as opposed to the traditional form of knowledge transmission. This fact was pointed out in Chapter Two by, among others, Burns (2011), when she presented ESE curriculum models with context and design that supported transitioning from transmissive teaching models to transformative learning processes.
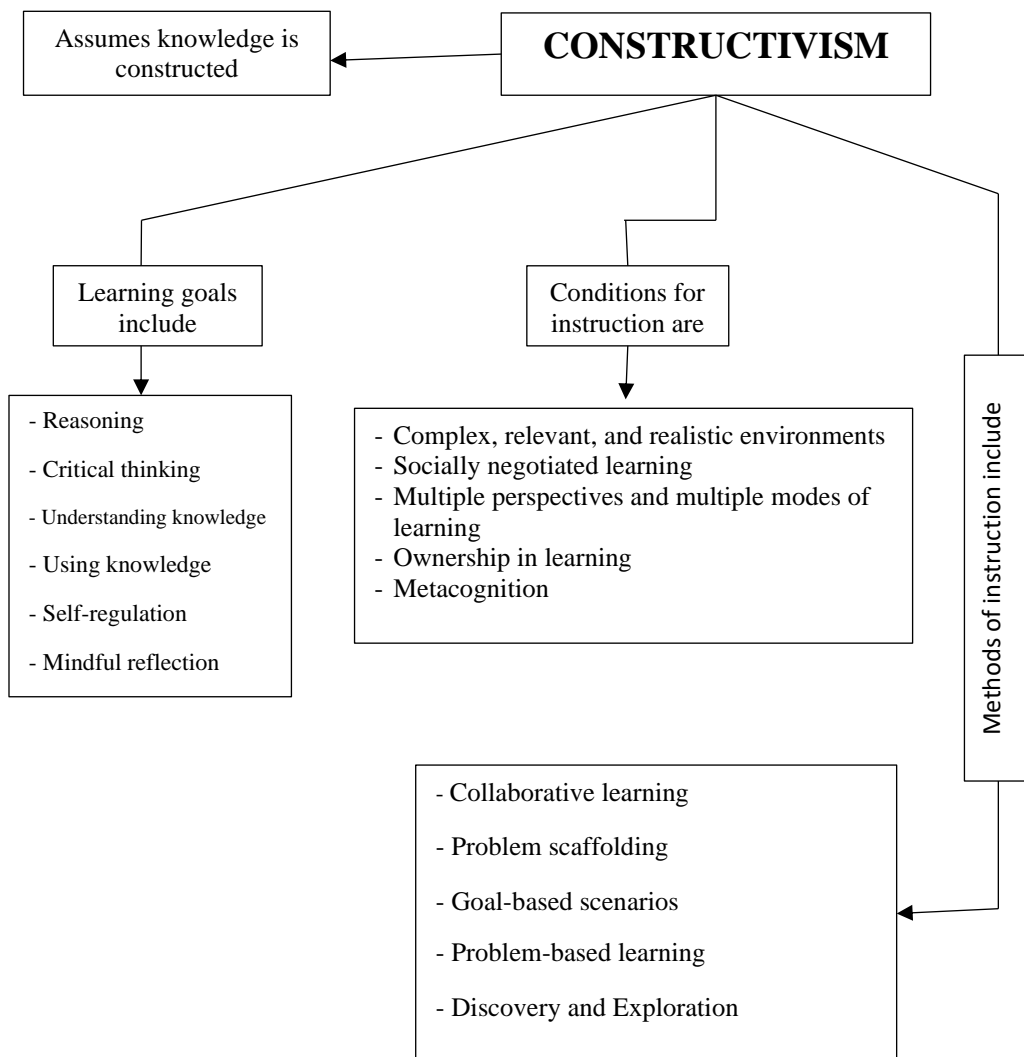
Figure 3.3: Elements of constructivist teaching and learning

Constructivist teaching, which is based on constructivist learning theories, is rooted in the work of Dewey, Montessori, Piaget, Brunner, Glasersfeld, and Vygotsky (Adak, 2017). As a theory of knowledge, constructivism focuses on how people learn and is rooted in philosophy, psychology, and cybernetics (Mugambi, 2018). The different positions held by those who advocate constructivist approaches range between

individual construction of knowledge and knowledge construction that is socially negotiated (Driscoll, 2014).

3.2.1.1 Constructivist assumptions about learning

The constructivist philosophical assumption holds that knowing is a process of actively interpreting and constructing individual knowledge representations. Knowledge construction is a function of prior experiences, mental structures and beliefs used by learners to interpret perceptual experiences of the world around them. The mind is key to the way learners interpret perceptions, and knowledge is a function of how individuals create meaning from their own experiences (Driscoll, 2014). Since knowledge is not passively received but is actively constructed by the individual who interacts with his or her surroundings, it cannot be transferred or transmitted through instruction alone. The creation of meaning is best realised when learners proactively interact with their surroundings, as they attempt to make sense out of their world (Heylien, 1997, in Slabbert *et al.,* 2009).

Learning environments that are guided by constructivist principles are pedagogical contexts that promote solving problems, using realistic approaches. In such learning environments, instruction goals are negotiated and learning is internally controlled and mediated by the learner with the instructing teacher acting as a guide and analyser of the strategies put in place to construct learning (Jonassen, 1999). This concept of social negotiation of meaning was advanced by Vygotsky, when he asserted that learners test their own understanding against those of teachers and fellow learners or more advanced peers (Driscoll, 2014).

The overarching principles that underpin constructivist thinking emphasise the fact that learning takes time as an active process that utilises sensory input to construct meaning as learners engage with the world around them. Constructivist teachings have a lasting effect on learners, both in their cognitive, as well as social realms as each meaning that learners construct improves their ability to give meaning to other sensory inputs, and this implies that the key action of knowledge construction is both a mental and a contextual social activity. During the learning process, a learner compares new information with what is already known and, by applying analysis and synthesis, knowledge that is based on both new and old information is constructed. What is implied here is that learners need to have adequate initial knowledge for new

knowledge to be established well. Such new knowledge comes from constant and complex interactions between individual and learning construction environments, as people interact with each other, putting together knowledge strands from different perspectives (Moshman, 1982).

As an approach to learning, constructivism holds the view that people actively construct or make their own knowledge and that reality is determined by the experiences of the learner. Constructivism is, thus, presented not as a unitary theoretical position, but as a continuum that authors, such as McLeod (2019) and Doolittle (s.a.), have divided into three broad categories of Cognitive Constructivism, Social Constructivism and Radical Constructivism. According to the aforementioned authors, whereas Cognitive Constructivism emphasises active mental construction of reality, Social Constructivism emphasises the construction of an agreed-upon socially constructed reality, while Radical Constructivists assert that all knowledge is constructed, but the constructed knowledge is invented and not discovered. Such invented knowledge only helps us to function with the environment and does not tell us anything about reality, implying that Radical Constructivism focuses on the construction of logical and consistent experiential realities (Glasersfeld, 1984).

Glasersfeld (1984) viewed constructivism as a theory of knowing, as opposed to being a theory of knowledge, and he asserted that knowledge is always the result of a constructive activity that cannot be transmitted to a passive recipient. He added that it must be actively built up by an individual knower. He further argued that there is no real world, no objective reality that is independent of human mental activity, and that our personal world is created by the mind: this suggests that no one world can be more real than the other. Overall, constructivist approaches integrate what is taught with cognitive, social and affective variables as the individual self in a learner is developed day by day. Knowledge, then, is not necessarily truth, but simply a construction of the self that is built through its relation with the environment (Carretero, 2000, in Angel & Nettle, 2018).

Both Glasersfeld and Piaget agree that knowledge is constructed by the individual (Driscoll, 2014). Personal constructivism entails social and interpersonal elements of learning, in which individuals are considered as principal creators of new knowledge (Raskin, 2002). Crowther (1999) adds that personal constructivism is a form of

contextual constructivism and includes what learners interpret and internalise, based on their individual culture and previous experiences (Pritchard & Woollard, 2010). In this study, social and interpersonal elements of knowledge construction included the TTIs and schools as institutional contexts, lecturers of PSTs, PSTs, and the TTI courses as interpersonal elements. All the contexts and interpersonal elements were important to this study, because they formed the basis of the present investigation to determine the extent to which TTIs in Eswatini prepared PSTs for teaching and integrating ESE into their curriculum planning and teaching practices.

Constructivism, as an epistemology, offers explanations on the nature of knowledge and how human beings learn. Many pedagogical practices associated with ESE incorporate a constructivist epistemology and are characterised by high levels of learner engagement, social interaction, transformational deep learning and critical pedagogy that is intrinsically emancipatory (Armstrong, 2011). That is why this study has considered constructivism as capable of informing ESE integration to determine how the knowledge, skills, and attitudes that PSTs in Eswatini acquired in TTIs were applied in their curriculum practices.

From an epistemological standpoint, constructivists, such as Masciotra (2005), postulate that people apprehend and comprehend new situations, modify their previous knowledge, and adapt to new situations to enrich their knowledge progressively, and this enables them to deal with increasingly complex situations. The knowledge that a person constructs is embedded in the socio-cultural and historical context of a society. Constructivism and the competency-based approach are consistent with each other, and constructivist approaches can be used as a basis to investigate SCs in ESE. Masciotra (2005) further elaborates:

> Pedagogical practices conceived within a social constructivist perspective consist of active experiential learning situations that are adapted to the level of the learners and that facilitate their construction of well-structured rich and diversified knowledge (Masciotra, 2005:11).

3.2.1.2 The development of constructivism

The development of constructivism can be traced to the period when psychologists, such as Moshman (1982), focused on learning, not only as an individual, but also as a social experience. Moshman's distinct branches of constructivism are grounded in

earlier works of Vygotsky and Piaget (Moshman, 1982). According to Moshman (1982), knowledge construction takes place as a result of interacting variables in the external environment of an individual in such a way that such an individual's environment determines the knowledge to be constructed in his or her cognitive structures. This, he referred to as exogenous constructivism and in it, he stresses the influence of the learner's lived context during the process of knowledge construction. Such influence in a teaching and learning situation includes instruction, experience and the use of models in the learning environment to which the learner adapts. The exogenous constructivist perspective is informed, among others, by Bandura's Social Cognitive Theory, in which he points out that learning construction results from maturation, experience, and the contribution of models in the social environment (Woolfolk, 2016).

Secondly, Moshman (1982), basing his work on Piagetian teachings, states that knowledge is internally constructed and that its transformation is a function of cognitive reasoning – a concept of internal knowledge construction that results from combining new and prior knowledge (Piaget, 1970). Moshman refers to this perspective as endogenous constructivism and adds that metacognition and reflection assist the knowledge assimilation process, as biological, psychological, sociological, and physical environments interact. Moshman also points out that Piaget's stages of cognitive development are an example of endogenous constructivism in that each of the four stages depends on the previous one. Deductive operations that PSTs are expected to apply to mediate ESE successfully emerge out of the previous stages of cognitive development that are expressed in Piagetian teachings (Santoyo, 2016).

The third form of constructivism is what Moshman (1982) called dialectical constructivism, in which he combined the effects of internal cognitive processes and external contextual settings in knowledge construction. The dialectical perspective, put forth by Moshman, is illustrated in this study in Figure 3.4 and provides a reasonable epistemology to guide investigations related to ESE mediation because it is characterised by social interaction that is considered to be dependent on internal cognitive processes.

Endogenous Perspective:
Teacher guides discovery
learning in the learners.

**Dialectical
Classroom:**
Reciprocal
teaching style

Exogenous Perspective:
Teacher's role is to model,
discuss, and explain.
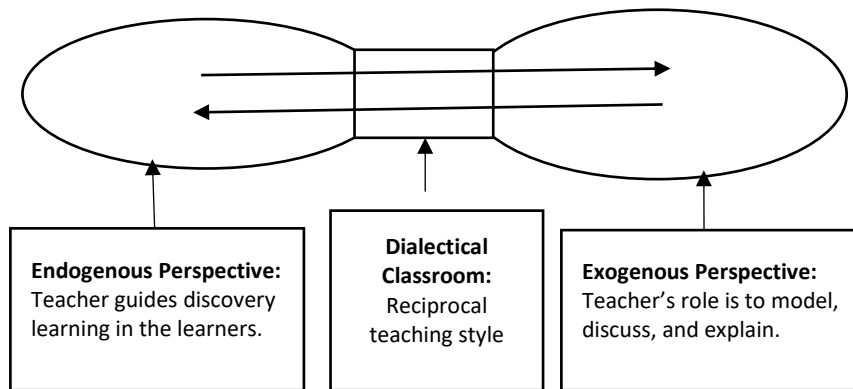
(Source: Adapted from Armstrong (2011)

Figure 3.4: The constructivist continuum highlighting reciprocal knowledge construction involving endogenous and exogenous constructivist perspectives

Riegel (1979) also argues in favour of concurrent endogenous and exogenous perspectives and points out that knowledge construction is a continuous process without separate stages. When Riegel's explanation is combined with Vygotsky's concept of the Zone of Proximal Development (ZPD), it brings out the idea of reciprocation between exogenous as well as endogenous learning; and it further highlights the fact that experiences and cognitive processes are closely linked with the context in which they occur (Bruning, Schraw & Norby, 2011). For this study, the component of an exogenous perspective implies that ESE mediation, if carried out using constructivist principles, should be characterised by much modelling and explanation on the environment and sustainability lifestyles, as learners adapt models and apply them in their contexts. These are the aspects of learning construction that the researcher observed during the lesson observations that were carried out as PSTs in Eswatini demonstrated their teaching skills during teaching practice.

Armstrong (2011), on the same topic, elaborates that the dialectical constructivist perspective is underpinned by Vygotsky's socio-cultural Theory of Higher Mental Processes. In that theory, Vygotsky highlights the importance of interfacing social activity and internal processes. Cognitive processes, he notes, are part of the learner's social group, and knowledge construction is a collective effort based on the learner's unique abilities. Within a ZPD, the learner is able to construct more knowledge, and this suggests that learning experiences should be designed to encourage learners to pursue activities that are pitched beyond their capabilities (Cole, John-Steiner,

Scribner & Souberman, 1978; Woolfolk, 2016). In terms of mediating ESE to prepare PSTs for teaching and integrating ESE into their curriculum planning and teaching practices, learners must experience sustainability and environmental issues in authentic settings and lived experiences that expose them to learning activities which, as earlier presented in the literature studied for this study, are transformative and interconnected learning construction spaces. To that effect, this study sought to discover ESE in TTIs' mediation practices that have learning strategies designed to guide learners to higher principles after dealing with both their conceptions and misconceptions. Part of the interview questions given to lecturers dealt with how they designed PSTs' learning experiences to ensure that adequate learning construction occurred. Again, in this study, the emphasis placed on the need for learners to interact with the social environment was highlighted in many different parts of ESE literature that were presented in Chapter Two.

In Chapter Two, authors, such as Filho *et al.* (2015) and Purcell *et al.* (2019), argue for lived ESE experiences; Sánchez *et al.* (s.a) and Sipos *et al.* (2008) point out the values and benefits of community engagement; while O'Donoghue *et al.* (2018) promote active-learning-led collaboration in ESE teaching and learning encounters. What is pointed out by El-Jardali *et al.* (2018) and Mawonde and Togo (2019) as the need for interdisciplinary or transdisciplinary educational experiences is, essentially, exposing learners to different social formations. Tilbury (2011), Fokdal *et al.* (2020) and Djordjevic and Cotton (2011) also point out that ESE is enriched by learning strategies that emphasise dialogue and cooperative experiences, because prior perceptions are expanded with new meaning. This is further confirmation that constructivist teaching strategies that lean towards a dialectical perspective, offer a viable option to integrate ESE into PSTs curriculum planning and teaching practices. Important to this study is the fact that meaning-making takes place in individual minds and is underpinned by socially-based experiences that are later used to share the new knowledge, as individuals engage in collaborative tasks. This is the reason why this study was partly informed by Piaget's notion of mental representation in human development, Glasersfeld's concept of individually constructed reality, and Vygotsky's emphasis on social interaction, because they contributed to knowledge construction in an individual. The just-mentioned three theoretical positions offered valuable facts that guided this research during the construction of the tool that was used during the

lesson observation, as I sought to establish the extent to which PSTs were prepared for the integration of ESE knowledge, skills and attitudes into their teaching practice.

Overall, the implications for teaching derived from different theoretical positions and underpinned by constructivist views, draw attention to real-life experiences, exploration of multiple perspectives, holistic instruction of broad concepts, and social interaction (Schunk, 2008).These are the same key aspects highlighted by a number of authors, including Tejedor *et al.* (2019), Boeve-de Pauw *et al.* 2015), and Lozano *et al.* (2019), who advocate for personal meaning making for effective ESE mediation and who stress that such personal meaning should be based on multiple perspectives that rely less on prescribed curriculum texts.

The authors in the above paragraph, also add that learners should be allowed to reconstruct what they already know so that the new ESE knowledge that is constructed may include different aspects of enriched CK. This, according to Driscoll (2014), suggests that a teacher can lead learners to new levels of conceptual understanding by interacting and talking with them. In this way, teachers offer guided and modelled participation. Careful scaffolding of course content by the teacher protects the learner from getting overwhelmed by what may be difficult. Such dialectical strategies for developing skills, values, and attitudes also emphasise collaborative, interactive and experiential discovery learning. The current study, while conducting lesson observations, investigated the prevalence of dialectical perspectives to observe and determine how such strategies influenced the extent to which PSTs were being prepared to integrate ESE knowledge, skills and attitudes into the Eswatini school curriculum.

3.2.1.3   Metacognition in knowledge construction

Constructivist didactics present learning as a process of self-organisation of knowledge that demands metacognitive competences from learners to become conscious managers of their own cognitive abilities and thought processes. Metacognition is, therefore, important in ESE mediation because variations and different interpretations raised by learners with diverse experiences contribute to knowledge construction characterised by a rich blend of information (Nehal, 2018). Another definition of metacognition is given by Aydin, Balim and Türkoğuz (2012) as knowledge of self-cognitive processes and the ability to regulate such processes.

Metacognitive knowledge can be referred to as declarative knowledge that has to do with the general skills that learners have, procedural knowledge about learner effectiveness in solving problems and attitudinal knowledge that guides learners when to apply specific strategies. A poor metacognitive formation during the teaching and learning experience interferes with knowledge construction. Learning to learn is the base of all the other ways of learning to be, learning to do and learning to act, aspects of learning that Biasutti and Surian (2012) linked to effective ESE mediation.

Kirbulut and Gokalp (2014) reaffirm that it is important, not only to provide constructivist learning environments for learners, but also for both learners and teachers to be metacognitive. They recommend that TTIs should gauge PSTs' metacognitive learning orientations in order to enhance their metacognitive abilities, given the fact that metacognition improves self-learning and didactic interactions (Tobon, 2010, in Angel & Nettle, 2018). Slabbert *et al.* (2009) add that metacognition in a learner promotes meta-learning, since learners take over ownership of their own knowledge construction and are then able to plan, execute, monitor, and assess their own learning independently.

According to radical constructivist views (Glasersfeld, 1984), there is no single reality, and our world is created by our mind, as we individually interpret events, objects, and perspectives in real world contexts. It is, therefore, important for learners to be aware of their own cognitive processes. This self-regulatory skill helps individuals to monitor their own learning processes. Learners need to not only know about their own cognition, but also regulate and control their thinking and learning. Such metacognitive strategies for selecting and monitoring mental functions promote creative and critical thinking that is also closely linked to effective ESE mediation (McLeod, 2019).

The management of the learners' teaching and learning experiences enables them to construct their knowledge as they engage in problem solving, while, simultaneously, transferring emerging experiences to new learning contexts. Given individual differences among learners, in relation to knowledge, skills, and experiences that shape their values and attitudes, it is essential to afford support to learners as they share knowledge from a variety of learning resources. Collaborative learning enhances the construction of socially grounded knowledge, as such contexts stimulate

cognitive activities in settings that promote problem solving. In such settings, there is interaction among learners, teachers, and more experienced experts (Yampinij, Sangsuwan & Chuathong, 2012). The discussion by Yampinij *et al.* (2012) is a constructivist discourse, which Qureshi (2020), also, pointed out in her findings where she states that when students collaboratively engaged in a variety of sustainable living practices, they easily demonstrated improvement in sustainability literacy.

The emphasis on active processes of learning supported by metacognitive processes, in part, prompted the current research to consider constructivist approaches as suitable lenses for gauging ESE mediation practices. Constructivism, as an approach and an epistemological position, provided guidelines to investigate how ESE could best be mediated to prepare PSTs in Eswatini for teaching and integrating ESE into their curriculum planning and teaching practices. This was based on the comparison made between the constructivist premises previously mentioned and the findings highlighted in the literature study presented in Chapter Two, part of which is illustrated in Figure 3.5, showing the combined theoretical and conceptual elements of this study. Important to this study is the fact that it was possible to explore the prevalence of constructivist guided practices during lesson observation schedules and, later, to analyse the level of ESE integration using appropriate analytical tools designed for this research. What follows is a discussion of how constructivist strategies facilitate effective ESE mediation.

3.2.1.4 Constructivist educative models for sustainability

The main reason the theory of constructivism seemed appropriate for this study is that it emphasises the individual construction of knowledge in socially mediated contexts. Constructivist educative models are considered by authors such as Angel and Neettle (2018), as being ideal for developing competences, because they are closely linked to metacognitive practices. Self-cognitive processes in learners help in the development of SCs, such as systems thinking competency, anticipatory competency, normative competency, strategic competency, collaboration competency, critical thinking competency, self-awareness competency, and integrated problem-solving competency (UNESCO, 2017a). SCs are developed through self-knowledge that reveals what students are capable of; that is, the values and attitudes they require to accomplish ESE tasks (Angel & Nettle, 2018). The current study explored the

development of SCs based on the constructivist educative models pointed out by the previously mentioned authors. SCs were investigated during lesson observations and during interviews with PSTs.

Doolittle (s.a.), also suggests that ESE should be mediated using approaches where learning takes place in authentic and real-world settings, characterised by social negotiation. In their comparative study on curriculum theory and practice, Woo *et al.* (2012) also included authentic learning spaces as part of the characteristics of sustainability curriculum models appropriate for ESE mediation. They found that learners were affected more by institutional activities that were grounded in local contextual experiences where the construction of knowledge was socially negotiated. Similar positions that such learning should be relevant to content and skills are taken by Loubser (2011), when he points out that quality teaching and learning experiences partly depend on locally contextualised relevant curricula.

Burns (2011), who used an identical sustainability living curriculum model in her research work, emphasises that educators should develop students' knowledge of subject matter, using relevant themes that promote participation within multiple dimensions. Content and skills should be understood within the framework of the learners' prior knowledge as learners are assessed formatively, serving to inform future learning encounters. Even Sipos *et al.* (2008) point out that integrating ESE into existing curricula supports personal and societal transformations to sustainability. They suggest that learners should be encouraged to become self-regulatory, self-mediated and self-aware, with teachers providing multiple perspectives and representations of content to serve as guides and facilitators of learning. This is what Shumba and Kampamba (2013) point out as an urgent need to engage in transformative ESE teaching, using alternative teaching and learning strategies that are also recommended by Qablan (2018) when he states that such strategies are appropriate learning arenas that should be managed using democratic principles.

Giangrande *et al.* (2019) saw such constructivist arenas as a form of learning that empowers students. Yet, in their research work, Ramsook and Thomas (2016) found that, although many PSTs were familiar with the principles of constructivist approaches, a number of them could not translate theory into practice, preferring the traditional frame of teaching. This is one aspect that is investigated in this study: to

establish whether the PSTs in Eswatini applied constructivism to teach and integrate ESE into their curriculum planning and teaching practices.

O'Donoghue, Kibuka-Sebitosi, Tshiningayamwe, and Palmer (2019) scrutinised ESD pedagogy to understand better and to support learning models that resonate with local African contexts and the emerging sustainability concerns in everyday life. They note that environment and sustainability knowledge is mediated in disciplinary fields as abstract concepts not relating to local sustainability concerns. Using constructivist approaches, ESD pedagogical practices can be transformed to strengthen situated learning, which O'Donoghue *et al.* point out as missing in ESD mediation, despite the fact that Johnston (2009) highlighted it as an effective form of ESE mediation.

Ultimately, when constructivist instructional practices are properly used as contexts for learning that are specially designed to support learner autonomy and belongingness, learners engage in intentional learning processes (Lebow, 1993, in Driscoll, 2014). In Chapter Two of this study, Aleixo *et al.* (2020) allude to constructivist instructional practices when they point out that simultaneous learning and living can be realised when learners are offered practical activities nestled in local contexts. In addition, some of the empirical literature on contextualising the SDG discourse in teacher education and training points to the need to apply constructivist approaches, especially constructing knowledge through the lenses of the 2030 UNGA. A good example is Wellington University in New Zealand that used integrative approaches that were constructivist in nature to address SDGs (Shiel *et al.,* 2020). The use of grounds as a medium for students engaging in ESE activities at Bournemouth University (Shiel *et al.,* 2020) is another teaching and learning context that further confirms the usefulness of constructivist guidelines for successful ESE implementation in HEIs. These were some of the learning aspects that the research observed and later analysed, guided by Rogan and Grayson's Theory of Curriculum Implementation.

Looked at from another aspect of educative models, Bruner's Constructivist Theory is a general framework for instruction modelled on cognitive processes and child development. He views learning as an active social process that is guided by cognitive activities, in which learners construct knowledge based on existing mental constructs. Bruner, further, adopts the view that learners at all ages are capable of understanding

complex information and he adds that complex ideas can first be taught at a simplified level and can then be re-visited to tackle more complex levels. He promotes discovery learning, a constructivist approach where learners construct their own knowledge for themselves by organising and categorising information through the process of discovering. Both Bruner and Vygotsky emphasise the importance of social learning, where social support helps a child to construct knowledge. Mugambi (2018) then forms a link that explains that this form of support, known as scaffolding, is similar to Vygotsky's notion of the ZPD, as explained in Section 3.2.1.2. This constructivist model offered guidelines for designing this current study's analytical frameworks that included indicators meant to identify elements of discovery teaching approaches applied by PSTs in Eswatini as they taught and integrated ESE into their curriculum planning and teaching practices.

DeVries (s.a) draws educational implications, which were found to be applicable to this study, out of Piaget's Theory of Human Mental Development. In her study, she sought to develop a constructivist educational paradigm characterised by coherence in theory and practice. Her constructivist paradigmatic prototype emphasises practice as a key constructivist component in constructivist education. She reminds us that the stages of cognitive development that Piaget described were meant to support his argument that knowledge, constructed as new information, is learnt by connecting it to things learners already know and enabling them to make modifications in their cognitive processes so that they are able to accommodate new information. Piaget, she adds, advocated active schooling that is similar to what was highlighted in Chapter Two in the empirical study findings of Biasutti and Surian (2012), Woo *et al.* (2012), Sipos *et al.* (2008) and Burns (2011), who, among others, emphasised cognitive-based active learning as capable of helping to form a questioning mind in a learner. These are the same knowledge construction practices that this current study investigated, based on the premise that ESE mediation would be best realised in constructivist classrooms.

3.2.1.5 Constructivist conditions for learning

For pedagogy, constructivism is a combination of practices that are student-focused, meaning-based, process-oriented, interactive and responsive to students' personal interests and needs. Such learner-centred constructivist approaches produce greater internalisation and deeper understanding than traditional methods (Driscoll, 2014). As

such, in a constructivist classroom, the creation of a collaborative learning environment, where students are actively involved in their own learning, is facilitated by the teacher. There is shared knowledge and shared authority as learning is mediated in small-size learning groups. The active process of knowing is influenced by the learner's surroundings and, with time, the constructed meaning becomes part of a learner's knowledge base. PSTs may require intervention to mediate better learning in a manner that may be different from the way they were taught in school. This can partly be realised during their teacher training and, later on, as part of in-service training (Driscoll, 2014). Authors, such as Shumba and Kampamba (2013) and O'Donoghue *et al.* (2018), among others, point out that ESE mediation efforts are best supported in natural settings that translate into expressions of multiple modes of representations that help to create new understandings. In such settings, learners collaborate in socially based contexts that individualise students' learning experiences to help with the development of processes, skills, and attitudes. Zitong (2019) observes that co-creating knowledge is based on real-life experiences and adds that teachers also develop their beliefs and practices through an interactive process. Therefore, in this study, the analytical frameworks used to determine the extent to which classroom teaching in Eswatini had constructivist elements, were designed based on some of the characteristics pointed out by Driscoll (2014), Zitong (2019) and O'Donoghue *et al.* (2018).

Four criteria that designate teaching methods as constructivist are activating prior knowledge, generating cognitive dissonance, applying knowledge with feedback, and reflecting on learning. In a typical constructivist lesson, stimulating prior knowledge relevant to a specific task at hand is elicited (Bruning *et al.,* 2011). Whatever knowledge learners use in a lesson is very important, because it guides their thinking and helps them to grasp new concepts, as they emotionally and cognitively engage in the activity at hand. Some of the activities include demonstrations, concept mapping and conducting open-ended discussions that include prevailing events of the time relevant to the learner. Such discussions generate cognitive dissonance that is considered relevant in a constructivist lesson, because misconceptions get exposed, suggesting that there could be challenging information a learner needs to confront. Similarly, the constructivist instructor mediating ESE, capitalises on cognitive dissonance by applying strategies that expose even more misunderstandings,

compares prior knowledge with what is being taught, and discusses missing links in narratives by asking provocative questions to sustain productive arguments (Bruning *et al.,* 2011; Hartle, Baviskar & Smith, 2012)

Feedback then becomes key to sustaining the process of integrating new knowledge. According to Hartle *et al.* (2012), such feedback should be presented by the teacher as detailed comments that are communicated through whole-class discussion, teacher presentation and peer discussion characterised by self-correction. Self-correction, as a metacognitive experience, can occur in the form of activities where learners explain variables, procedures and inferences through compositions, demonstrations, reports and peer teaching (Hartle *et al.,* 2012). The characteristics of a constructivist classroom point to individual knowledge construction, as well as group collaboration for the construction of knowledge.

The contrast between the elements of a constructivist classroom and a traditional classroom is presented in Table 3.1 below.

Table 3.1: A comparison of types of classrooms

Traditional Classroom	Constructivist Classroom
Curriculum begins with the parts of the whole. Emphasises basic skills.	Curriculum emphasises big concepts, beginning with the whole and expanding to include the parts.
Strict adherence to fixed curriculum is highly valued.	Pursuit of student questions and interests is valued.
Materials are primarily textbooks and workbooks.	Materials include primary sources of material and manipulative materials.
Learning is based on repetition.	Learning is interactive, building on what the student already knows.
Teachers disseminate information to students; students are recipients of knowledge.	Teachers have a dialogue with students, helping students construct their own knowledge.
Teacher's role is directive, rooted in authority.	Teacher's role is interactive, rooted in negotiation.
Assessment is through testing, correct answers.	Assessment includes student works, observations, and points of view, as well as tests. Process is as important as product.

Traditional Classroom	Constructivist Classroom
Knowledge is seen as inert.	Knowledge is seen as dynamic, ever changing with our experiences.
Students work primarily alone.	Students work primarily in groups.

(Source: Adapted from Educational Broadcasting Corporation, 2004)

The constructivist classroom is projected as being holistic, with emphasis on engaging learners in teaching and learning experiences that are characterised by metacognitive efforts (Educational Broadcasting Corporation, 2004). In this study, the four criteria suggested by Bruning *et al.* (2011) formed part of the indicators that have been used in designing the analytical frameworks that determined the extent to which appropriate teaching methods were applied by PSTs in Eswatini to teach and integrate ESE into their curriculum planning and teaching practices. The elements of a constructivist classroom were guides in designing the lesson observation schedule applied to PSTs, as they carried out their teaching practice.

Le Grange (2016) suggests that constructivist approaches applied to mediate ESE should be viewed rhizomatically; that is, in the form of a distributed knowledge system inclusive of all knowledge such as indigenous knowledge that has for a long time been marginalised. Literature study findings by Strachan *et al.* (2019), relating to the connected curriculum at London University College, support Le Grange's assertion that constructivist approaches can potentially connect ideas, tools and skills of community members, academics, and learners. The rhizomatic view positions ESE in a constructivist context that challenges humankind to act positively on planet earth to take charge of key environmental and sustainability issues by applying what Mudaly and Ismail (2016) refer to as multi-pronged approaches to meaningful integration of ESE content. This study considered knowledge system variations to be key to applying constructivist approaches. Therefore, the interview questions designed for lecturers and PSTs included those that explored the type of knowledge systems with which they preferred to operate to teach and learn for sustainability.

Constructivist approaches in ESE mediation can help to confront challenges for both ESE knowledge production and curriculum implementation, to which Reddy (2017) indicates that many traditional disciplines have well-defined knowledge bases that ESE does not have. He points out that contextualised knowledge generation,

underpinned by practice-based processes, is vital to the integration of environmental issues and the realisation of sustainability goals in teacher education. He further says that teachers are knowledge professionals in possession of active knowledge – knowledge of the what, how and why in moments of practice.

Reddy (2017), moreover, suggests that the knowledge domains of learning, in and from practice and situational learning that requires understanding contexts, should provide space for teacher education programmes to include ESE understandings, knowledges and practices, a combination that equates to what was highlighted in Chapter Two by Qablan (2018), Stevenson (2007) and Avery and Nordén (2017) when they pointed to the need for learning contexts that were transformative and interconnected learning spaces. In the current study, this was vital knowledge that provided indicators to analyse how the knowledge, skills and attitudes which PSTs in Eswatini acquired in TTIs prepared them for teaching and integrating ESE into their curriculum planning and teaching practices. Therefore, in this study, document analysis of curriculum texts in the two TTIs was partly based on knowledge labels presented by the authors mentioned earlier (*cf*. 2.6.1 and *cf*. 2.6.2).

By stating that 'programmes need to develop capacity for relational thinking connected to the relational complexities of teaching in teacher education', Reddy is directly pointing to constructivist classrooms characterised by productive pedagogies (Reddy, 2017:124). Transformative social learning, projected by Læssøe (2018) as a form of learning encompassing the concepts of collectivity, experience and collective experience-making, is constructivist and was highlighted in Johnston's (2009) theoretical literature study, presented in Chapter Two as being a useful approach to ESE mediation. The constructivist classroom characteristics, highlighted by Reddy (2017), Læssøe (2018) and Johnston (2009), offered guidelines during the designing of lesson observation schedules used in this study. The same information was useful in the designing of analytical frameworks used to analyse data collected during lesson observations.

Since constructivist educators design activities in constructivist classrooms to appeal to learner's interests that include experimentation in social contexts, any institution that considers itself to be constructivist should demonstrate that there is constructive activity in the mental realms of learners. Activities in the mental realm are indirectly

observed as manifestations demonstrated by learners in learning construction sites. The constructivist teacher proactively involves learners in many classroom activities, including conflict resolution, as well as promoting children's shared experiences, reciprocal reasoning, and collaborative decision making (DeVries, s.a.).

Constructivist strategies, tools and practices account for effective teaching and learning, because there is optimal communication that results in the construction of relevant and meaningful knowledge (Powel & Kalina, s.a.). This current study considered the constructivist approach an appropriate theoretical basis for a teaching model with which ESE mediation could be investigated, because, in such a model, the process of learners codetermining the learning can be observed; this is a teaching and learning experience, to which Woo *et al.* (2012) refer as mutual learning. Based on this constructivist theoretical foundation, this present research obtained data through a lesson observation schedule that was later analysed to determine the extent to which PSTs were being prepared to integrate ESE knowledge, skills and attitudes into the Eswatini school curriculum.

3.2.1.6   Constructivism challenged

The term constructivism is used in many fields and it represents different meanings. To many critics, constructivism is purely ideological and empty of meaning. Such critics point out that the label constructivist teaching is used by many authors as being synonymous with any form of teaching that is child-centred, inquiry-based, active, interactive and inclusive (Sjøberg, 2010). Critics further claim that constructivists de-emphasise single interpretations and focus more on the learning process and less on the product of learning. Moreover, they claim that learners with special learning needs may not cope well in constructivist environments, because they do not understand underlying mental models that support hands-on learning. Constructivist settings are considered to be elitist, to serve privileged learners best, and to create inequality gaps. With so many countries having a very large learner-to-teacher ratio, teaching effectiveness cannot be guaranteed using constructivist approaches (UK Essays, 2018).

Implementing constructivist pedagogy is thus seen by many people as a challenging endeavour, with some educators viewing teacher-centred approaches as being more

effective than learner-centred ones, especially for the purpose of enhancing academic achievement to obtain good external grades (Driscoll, 2014).

Nehal (2018) notes that, although constructivism is widely accepted among teachers, a lack of understanding of constructivist principles can potentially lead to teaching practices that devalue learners' prior knowledge and experiences. Her findings revealed that teachers had different understandings and interpretations of constructivist principles, with many key aspects, such as metacognition, apprenticeship and exploration being absent in the lessons she observed. This current study, therefore, looked out for any demonstration of such constructivist approaches that PSTs in Eswatini applied to teach and integrate ESE into their curriculum planning and teaching practices.

ESE integration, as an intervention to transform education into an inclusive and collaborative pedagogy, requires constructivist approaches. As a situated engagement, ESE can best be mediated when guided by constructivist principles that are known to bring out relevance in social learning spaces (Pesanayi, O'Donoghue, & Shava, 2019). Transitioning to sustainability in the 21st century digital age involves embracing life-long learning, enhancing social cohesion and realising future sustainability. This requires that SCs are best developed and use constructivist approaches, some of which are carried out on technology platforms. Learners, such as PSTs, become part of communities of inquiry and join online learning communities that are immersed in a social-cognitive presence that supports them to recognise and reproduce content, as they construct new knowledge (Garrison, Anderson & Archer, 2000; O'Donoghue *et al.,* 2019). Overall, the constructivist approach, as part of the theoretical framework for this study, was the foundation for establishing the credibility of the research findings because the pragmatic approach used in this study sought to establish whether or not constructivist learning environments existed to support meaningful ESE mediation through strategies that promoted individual, as well as group knowledge construction (Amineh & Davatgari, 2015).

The preceding discussion, detailing constructivism as a theory of knowing, having been considered as a relevant episteme in this study, was an attempt to highlight recommended learning environments that support ESE practices. It was emphasised that many pedagogical practices associated with ESE incorporated a constructivist

epistemology. Even though constructivism was considered as a notion capable of informing ESE mediation, it could not be applied in analysing how constructivist ESE mediation prepared PSTs for teaching and integrating ESE into their curriculum planning and teaching practices. In the documented literature study presented in Chapter Two, there is little information on the status of ESE integration in TTIs in Eswatini. Nevertheless, some of the empirical research findings have shed light on a few practices. These practices include findings by O'Donoghue *et al.* (2019), O'Donoghue *et al.* (2018) and Shumba and Kampamba (2013), among others. The lack of information on curriculum integration and the effect this has on the quality of education could be partly because of a lack of suitable research methods, especially methods to analyse appropriate classroom practice (Nsubuga, 2011).

The next section introduces theories that guided this study in the process of analysing research findings, using analytical tools that were developed and guided by the theories that are explained in the next section.

3.2.2 Bernstein's Concepts of Classification, Framing, and Knowledge Re-Contextualisation

Bernstein is interested in how the economic and social systems affect curriculum and pedagogy, so as to be able to explain the processes of schooling in the context of social interactions and the construction of knowledge. As such, Bernstein's theories provide tools for analysing and describing educational processes at all levels (Bernstein, 1975; Bernstein, 1990).

Bernstein's work analysed the relationships between the processes of schooling shared meanings, practice and pedagogic discourse, among others. The concepts of classification and framing can, thus, be used as a model to illuminate the effects that different components of the curriculum exercise have on the teaching and learning experiences for both teachers and learners. The interactions, boundaries, timing, place, pacing, selection and organisation of elements within curriculum message systems have a great impact on curriculum practice in the classroom. Classification and framing are knowledge codes that can provide a language that describes relationships, interactions and pedagogical practice. The two concepts, in turn, provide a language to analyse and describe how the knowledge that learners develop is relayed and constructed before it is shared (Bernstein, 1971). This is the main reason

some of the analytical tools in this study were designed and guided by Bernstein's constructs.

Ensor (2004) notes that teacher education programmes, offered by many HEIs in South Africa, were relatively strongly classified and strongly framed and, therefore, projected an image of preferred classroom practice that was also strongly classified and framed, implying that there is a close resemblance between teacher education and school teaching curriculum practices. This current study sought to discover how teacher education and school teaching practices compared. Analytical tools were needed to analyse data, not only collected from lesson observations, but also from curriculum texts.

3.2.2.1 Bernstein's concept of classification of educational knowledge

By classification of educational knowledge, Bernstein (1971) is referring to the boundary strength between what is classified, that is, the degree of boundary maintenance between the content of subjects. Strong classification of educational knowledge is characteristic of subjects having very distinct boundaries, and this means that they are well insulated from each other. Weak classification of educational knowledge refers to the weak boundaries between the subjects and is characteristic of integrated subjects with little insulation between them (Harley, 2010). Classification of teacher education discourse, therefore, refers to the distinctiveness and degree of specialisation of the discourse, as carried out in TTIs.

In order for the current study to analyse the extent to which PSTs were being prepared to integrate ESE knowledge, skills and attitudes into the Eswatini school curriculum, a research tool based on Bernstein's concept of classification, was utilised. The analytical research tool used in this study was adapted from one originally designed by Nsubuga (2011) to analyse and monitor the extent to which environmental issues were integrated into teachers' lessons. Nsubuga (2011) designed an analytical research tool, guided by the principles of curriculum integration that were advanced by Basil Bernstein, who posits that curriculum organisation is a social construction where a particular group of people select, distribute and evaluate educational knowledge they have classified in the form of subjects (Bernstein, 1990).

Bernstein (1971) describes relationships between subjects in pedagogic contexts by considering the nature of the boundary that exists between the categories of a curriculum. Furthermore, he emphasises the fact that integration in pedagogic contexts must highlight a meaningful functional relationship between subjects whose boundaries are less distinct. To that effect, the analytical research tool used in this study was applied to the concept of classification as a theoretical lens through which the boundary between ESE content and course content offered by TTIs to PSTs was analysed to explore the extent to which ESE content was integrated into different courses as PSTs in Eswatini were being prepared for teaching and integrating ESE into their curriculum planning and teaching practices. Bernstein identified two types of classification that he referred to as internal classification and external classification. While internal classification highlights relations between subjects in a curriculum, external classification shows relations between academic and non-academic activities. This study investigated both types of classification in that it not only explored the relationship between ESE knowledge within the TTI curriculum documents, but also investigated the relationship between ESE and TTI administrative practices that affect ESE mediation efforts.

3.2.2.2 Bernstein's construct of framing educational knowledge

Bernstein (1990) uses the construct of framing to explain the power and control of relationships that influence what is taught in the classrooms and how teaching and learning are conducted. This control over communication within didactic discourse involves activities linked to sharing knowledge during teaching and learning. According to Bernstein, control in didactic discourse translates into specialised regulations that culminate into controlling the communication process (Bernstein, 1990). He says, 'Framing refers to the degree of control teachers and pupils possess over the selection, sequencing, pacing and evaluation of the knowledge transmitted and received in the pedagogical relationship' (Bernstein, 1975:88). Therefore, framing can also be used to refer to the strength of the boundary between what may be transmitted and what may not be transmitted in the pedagogic relationships. Internal framing refers to the control of relations within a particular lesson, and external framing refers to the control of a lesson from external sources, such as that exerted by curriculum policy or prescribed schemes of work on a programme of study. A syllabus with rigid topics to be completed in a predetermined order within a specified time frame would represent

strong framing. Weak framing would occur when a teacher is able to select topics based on the pupils' interest and to organise the sequence and pacing of the learning material according to the developmental stages of learners (Bernstein, 1971). Framing provides a language of description, from which we can understand what learners have access to and what they do not. This could refer to aspects of timing of curriculum content in the sense of what and when content is taught with consideration to what takes priority over the other. It further refers to how meanings in the classroom are constructed and made public, and to the nature of the social relationships behind putting such meaning together. In the classroom, framing can be used to refer to the relationship between the teacher and learners and the degree of autonomy each person has in that relationship with regard to what the learners have access to, when content is taught, how that content is prioritised, and what the physiological and environmental factors are in which learning takes place (Bernstein, 2000).

In my study, the notion of framing was used as a second theoretical lens through which the relationship between teachers and learners was analysed to determine the relative degree of control between PSTs and the school learners whom they taught. According to Bernstein (1990), strong framing would imply that students have limited control over the way knowledge is constructed. Tied to the constructivist approaches, this study applied framing to observe how knowledge was constructed during ESE mediation. Framing offers the mechanism to achieve classification and implies that the two concepts are dialectically linked (Hoadley, s.a.). In the literature study carried out in this study, the relationship between everyday knowledge and what is taught in schools and HEIs highlighted by authors, such as Johnston (2009), Wals (2010), O'Donoghue *et al.* (2018), among others, is also referred to by Bernstein, who posits that the framing strength is a measure of boundary insulation between educational knowledge and everyday community knowledge of educators and those they teach (Bernstein, 1975).

Morais (2002) points out that weak classifications and weak framings are essential conditions for learning with regard to pacing and knowledge construction, when separate subjects are considered during micro-implementation of curriculum practice. The way characteristics of pedagogic practice, such as pacing and knowledge construction, interact to produce better learning needs to be clearly understood in order to use these characteristics correctly as guidelines for designing analytical tools. According to Morais (2002), Bernstein repeatedly argued for weak framing of pacing,

insisting that learners needed to have some control in the process of knowledge construction. Morais (2002) further points out that when the process of knowledge transfer is characterised by a weak classification implying weak insulation between the various contents to be learned, learners grasp abstract concepts better. He goes on to emphasise that a weak framing during the micro-implementation of a curriculum creates learning construction environments that allow learners to question, discuss, and share ideas. Morais (2002) is emphatic on the need to have effective teacher training that supports the development of competences capable of creating classroom social contexts, where an interplay between classification and framing strengths emerges in favour of effective learning construction. Academic and non-academic discourses, according to Morais (2002), should be characterised by strong classification, meaning that there should be strong insulation between them, but with a close relation of communication so that knowledge is made more meaningful, more understandable, and more applicable. Part of Bernstein's argument that all modes of pedagogy, such as teacher education, vary according to their classification and framing, prompted the current research to consider classification and framing as appropriate concepts for grounding the way in which analytical tools were designed for this study. The greater the degree of specialisation, the greater will be the distinctiveness of the discourse, in relation to others, and the stronger its classification (Bernstein, 1990; Morais, 2002).

Educational policy, at the beginning of the 21st century, attempted to shift both teacher education and classroom teaching to allow not only for a weakening of framing relations but also for a weakening of classification of educational knowledge. Little attention was given to the structuring of teacher education courses and what they potentially make available to student teachers (Ensor, 2004). Hence, Bernstein's description of pedagogy provided this study with useful conceptual frameworks to analyse the strength of classification and the framing of teacher education discourse to establish how the strength variations of classification and framing influence the preparation of PSTs in Eswatini for teaching and integrating ESE into their curriculum planning and teaching practices.

In the end, the research tools that were designed to analyse the strength of classification and framing helped to shed light on the extent to which PSTs were being prepared to integrate ESE knowledge, skills and attitudes into the Eswatini school

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curriculum. In other words, classification and framing are both aligned to the constructivist notion that curriculum implementation is a socially mediated undertaking that is guided by the choices and decisions taken by educational leaders, as they engage in the whole curriculum process (Cause, 2010). In this study, framing and classification offered the descriptive language with which the research tools could be designed to analyse not only the strength of any boundaries that may have been maintained during Eswatini PST preparation in TTIs, but also the strength of framing so that the context, in which ESE knowledge is constructed to prepare PSTs for teaching and integrating ESE into their curriculum planning and teaching practices, is clearly understood.

3.2.2.3 Bernstein's concept of educational knowledge re-contextualisation

In Bernstein's set of theories, re-contextualisation refers to the transformation of knowledge between sites or groups of people, where knowledge construction takes place. In this study, it refers to the transformation of knowledge that takes place as PSTs in Eswatini are prepared for teaching and integrating ESE into their curriculum planning and teaching practices and, also, to knowledge transformation that occurs when PSTs are teaching in schools. Bernstein (1990) posits that in social formations, where the individual is privileged to have a significant input into the process of curriculum implementation, a situation that was previously referred to as being characteristically a form of weak classification and weak framing, the re-contextualisation of knowledge between sites or groups is relatively open, leaving room for dialogue and negotiation. The constructivist approach to learning, which was covered in Section 3.2.1 of this study, identifies with the pedagogic mode of social organisation, where knowledge is negotiated in a context that is characterised by weak classification and weak framing (Ivinson & Duveen, 2006).

The concept of re-contextualisation is applied to study pedagogical discourse and the construction of educational knowledge. This is noted by Bernstein (2000), who also refers to three sites as being responsible for knowledge transformation: the field of production, the field of re-contextualisation, and the field of reproduction. Within these three fields, argues Bernstein, pedagogical discourses are transferred from one education site to another. At the field of production, new knowledge is constructed and it exists in its original context, before it is decontextualised in the field of re-

contextualisation and, thereafter, it assumes a hybrid characteristic. The field of re-contextualisation links the field of production with the field of reproduction. It is at the field of reproduction that Carl (2010) calls the micro-implementation level in curriculum practice where pedagogic practice takes place (Bernstein, 2000). Bernstein further clarifies that the field of re-contextualisation is made up of the Official Re-contextualisation Field (ORF) and the Pedagogic Re-contextualisation Field (PRF). The ORF consists of educational departments, authorities, and agencies operationalised by the state, and the PRF consists of HEI departments associated with offering educational services. In this study, the fields of production are universities that carry out research that influences ESE practices in Eswatini. Examples of such universities are, among others, the University of Eswatini, the University of South Africa and Rhodes University. In the context of this study, the ORF is the EMoET and the senate of institution TA. The PRFs are the TTIs, where ESE is mediated to prepare PSTs for teaching and integrating ESE into their curriculum planning and teaching practices, and the schools, where PSTs carry out teaching practice.

In his explanation, Bernstein (1990) emphasises the importance of analysing the role of the ORF in the relations and the movement of curriculum discourses between, as well as within, any given pedagogic fields. Therefore, this study used the theory of re-contextualisation, as a third theoretical lens to help to discover changes that occur during ESE mediation processes, as ESE knowledge is passed on across the fields of pedagogic discourse, first in the lecture rooms at TTIs during PST preparation, and later in schools where PSTs conduct their teaching practice while being prepared to teach and integrate ESE into their curriculum planning and teaching practices. Bernstein's re-contextualisation concept offered a theoretical framework that guided this study in comparing the narrative data that were collected during interviews, lesson observations, and document analysis as the research explored the extent to which pedagogic discourse on ESE was altered, not only at the stage of preparing PSTs for teaching and integrating ESE, but also when PSTs reproduced ESE discourse in the reproduction field, while conducting teaching and learning activities in schools.

It is worth noting that HEIs in Eswatini are, to a large extent, autonomous PRFs in curriculum practices at classroom level. Therefore, the extent to which texts are officially recontextualised depends a lot on the curriculum structures of individual institutions; for example, institution TA, as a PRF, determines the way its courses are

structured with final approval from the EMoET. As such, this study offered a research avenue to analyse the extent to which the ESE pedagogic discourses at PRFs, in the form of TTIs, compare with the ESE knowledge that is produced at the field of production. In this study, four cases, involving two TTIs and two schools, represent the reproduction field of pedagogic discourse that is associated with ESE. Lesson observations were carried out at the two TTIs and the two schools in order to understand and explain the extent to which knowledge was altered at the reproduction fields. To that effect, the research studied the activities and practices of PRF and the curriculum reproduction sites and later analysed the nature of the relations between the re-contextualisation field sites and the reproduction sites.

In the context of this study, it was very important to investigate the two TTIs as autonomous PRFs, in order to determine how the curriculum re-contextualisation process influenced pedagogical practices, as PSTs were prepared for teaching and integrating ESE into their curriculum planning and teaching practices.

3.2.3 Rogan and Grayson's 2003 Theory of Curriculum Implementation

> Changing teaching and learning should be viewed as a change of culture rather than merely a technical matter (Rogan & Grayson, 2003:1200).

Rogan and Grayson (2003) laid the groundwork for the way in which data on curriculum implementation could be analysed. They envisioned that implementation of curricula initiatives and improved educational practices could make use of their implementation theory in different subject areas. This study presents such an educational practice – ESE, mediated as the knowledge, skills and attitudes PSTs acquire in TTIs, which prepares them for teaching and integrating ESE into their curriculum planning and teaching practices. According to Rogan and Grayson (2003), implementation must take the context of a particular educational institution, such as a school system, made up of teachers, learners, administrators and the physical environment, and should be established on the strengths of various components of the educational system in place. Additionally, implementation refers to what takes place in the classroom as a learning environment that should operate optimally when adequately supported (Rogan & Grayson, 2003).

Rogan and Grayson's theory was considered to be appropriate in providing guidelines for this study to design analytical tools that were developed alongside the ones based on Bernstein's concepts which address curriculum integration practices, as discussed in Section 3.2.2 of this study. The Rogan and Grayson's Theory of Curriculum Implementation has been adapted in this study to explore the extent to which contexts of TTIs, where ESE has mediated, supported or hindered implementation of curriculum practices that were carried out to prepare PSTs for teaching and integrating ESE into their curriculum planning and teaching practices. Rogan and Grayson's theory presents three constructs that are associated with effective curriculum implementation practices in spaces, which Bernstein (1990) mentions as reproduction fields for curriculum implementation. The constructs are the profile of implementation, the capacity to innovate and the support from outside agencies. This study has used the capacity to innovate in order to design analytical tools to help determine the extent to which PSTs were being prepared to integrate ESE knowledge, skills and attitudes into the Eswatini school curriculum. Altnyelken (2010) cautions that curriculum implementation can be difficult to analyse, unless there is an appropriate analytical tool because, at the micro-implementation level, different implementation factors could emerge, making it difficult to establish reasons for such variations.

3.2.3.1   Capacity to support innovation

In Eswatini, like many developing nations, educational innovation is sponsored and funded by government agencies that are operationalised through various ministries. The EMoET has management teams that carry out innovation projects that have been approved by government. The EMoET policy implementing organs make major policy decisions that are implemented at grass-roots levels, such as at TTIs and schools. Additionally, authorities within government ministries, such as EEA, are able to carry out professional development activities that stimulate innovation and, in some cases, raise financial support to complement government efforts. This study considered EMoET, as well as EEA, as organisations that provide support to TTIs, schools and PSTs in their effort to teach and integrate ESE into their curriculum planning and teaching practices. To that effect, the study analysed the way their intentions were manifested, as they supported innovation. Rogan and Grayson (2003) postulated that increases in the capacity to support innovation would enrich the quality of curriculum implementation in the classroom.

The indicators that support innovation are factors that are likely to support or obstruct the implementation of innovative curricular practices, such as those presented in Chapter Two and are highlighted as ones supporting ESE mediation. According to Rogan and Grayson (2003), they consist of physical resources, school ethos and management, teacher factors, and learner factors. Physical resources, administration, and governance influence the teaching and learning experiences of learners. Physical resources are important, because poor living conditions and a scarcity of resources can impede effective curriculum practices. The overall school and TTI ethos and the quality of management have a direct effect on the educators' professional performance in the institutions where they serve. It should be emphasised that teachers and lecturers' input is key to any attempts to introduce new methods, new ideas and improved educational products, since they proactively assimilate innovations into their knowledge construction patterns to support pre-existing teaching practices. Ultimately, the capacity of a school or a learning institution, such as a TTI, to implement reforms is greatly influenced by the quality of infrastructure and the characteristics of teachers and learners. For this study, the capacity to support innovation also refers to undertakings that promote curriculum integration to realise preferred and recommended pedagogical approaches, such as trans-disciplinary, transformative, participatory and, hence, pluralistic active learning processes, and learning-led teaching. These are approaches considered by authors, such as Sammalisto and Lindhqvist 2008), Johnston (2009), Burns (2011), Kopnina (2018), and O'Donoghue *et al.* (2018), among others, to be effective ESE mediation strategies. Therefore, this study investigated the capacity to support innovation in the four cases that formed part of this study.

A study by Molapo and Pillay (2018) concurs with that of Rogan and Grayson (2003) in stating that successful curriculum implementation, in part, relies on adequate support in the form of resources and training acquired from a variety of key stakeholders. Specific to ESE mediation, since constructivist approaches have been presented as effective pedagogical practices that positively influence PSTs to acquire knowledge, skills, and attitudes necessary for effective teaching and integrating of ESE, the lack of proper infrastructure becomes a limiting factor that not only compromises the performance of lecturers and teachers, but also undermines efforts by learners to meaningfully participate in the active construction of knowledge. The

physical infrastructure, as a working environment, is crucial for new practices, such as the 2030 UNGA initiatives that in this study were considered valuable pedagogic resources that could be decontextualised and applied in the classroom. The usefulness of Rogan and Grayson's constructs, as part of appropriate analytical tools, is clearly indicated by the quality of narrative data generated for analysis of this study findings. The details of all the analytical tools that were designed to determine the extent to which TTIs in Eswatini prepared PSTs for teaching and integrating ESE into their curriculum planning and teaching practices are presented in Chapter Five.

Figure 3.5 illustrates the interface between the theories used in this study and the major concepts that show how they interrelate in order to reveal the way PSTs are prepared for teaching and integrating ESE into their curriculum planning and teaching practices.

Teaching and integrating ESE into curriculum planning and teaching practices of PSTs in TTIs in Eswatini

Analysed

Best mediated in

Analysed using.

Analysed using.

Bernstein's Theoretical corpus: Classification, Framing, and Knowledge

Constructivist settings that are: Transformative, Holistic, Participatory, Action oriented, Learner-centred, and Learning-led, grounded in inter- and transdisciplinary knowledge construction

Rogan and Grayson's Theory of Curriculum Implementation

The Chi square non-parametric inferential test of independence

To establish

To establish

To establish

(i) Extent of ESE integration in curriculum texts and classroom practices

(ii) Modes of pedagogic transmission

(iii) ESE implementation in recontextualised pedagogical texts

Found in

Evidenced in

(i) Curriculum documents: course outlines, lesson plans & 2030 UNGA objectives

(ii) Classroom practices

(iii) Capacity to support innovation

That result in

The development of SCs for knowledge, skills, and attitudes, that is, learning to: know, do, be, and live together.

Resulting in

Acquisition of environmental knowledge and pro-environmental attitudes that shape sustainability lifestyles

To address

Resulting in

Cognitive, Socio-emotional, and Behavioural domains of

Ultimately leading to

The development of environmental awareness, literacy, and engagement due to transformed behaviour

Preparedness by PSTs to teach and integrate ESE into their curriculum planning and teaching practices.

Figure 3.5: The interface between the theories and concepts used in this study

3.3   CONCEPTUAL FRAMEWORK

The conceptual framework of a study refers to the system of concepts, assumptions, expectations, beliefs and theories that supports and informs the research work undertaken in that study. In such a system, key factors, concepts and variables, as well as the presumed relationships among them, are explained (Miles, Huberman & Saldaña, 2014). As tools for organising inquiry, conceptual frameworks create data-driven arguments in which trustworthy research findings can be found (Antonenko, 2014). The series of engagements, constituting a conceptual framework, which Ravitch and Riggan (2017) considers to be sequenced, logical propositions are designed to ground a study as an important and rigorous undertaking. In this study, this series of engagement was the systematic way of thinking through and articulating what the research planned to do and how it planned to carry out the entire study (Ravitch & Riggan, 2017).

Developing a conceptual framework enabled this study to be selective, to prioritise variables, and to recognise particular relationships within this research work to the effect that as it designed and developed this conceptual framework, it progressively internalised the core concepts. The conceptual framework does not include formal theories and was designed alongside a separate theoretical framework. However, the conceptual framework does not constitute a review of literature, even though it is partly made up of documented literature to offer explanations and information about the key concepts in this study.

As cautioned by Maxwell (2013), this conceptual framework was regularly adjusted as it added more components, whenever new relevant ideas and understandings that opened the researcher's mind to deeper understanding were found. Thus, this conceptual framework, as explained by Maxwell (2013), is the actual framework of ideas and commitments that informed this study. This conceptual framework was created from many sources about ESE realities, some of which are presented in the literature study in Chapter Two of this study.

The visual representation of the structure of this study and its alignment with the theoretical foundation on which it is founded is presented as Figure 3.5. The conceptual framework for this study was developed so that, as Maxwell (2013) puts it, all key components of the research task would be highlighted to create a compelling

narrative of the importance and rigour of this study. The compelling narrative in this study is a collection of all the ideas that were put together to explain the concepts in the contexts in which it explored Educational Realities about ESE in TTIs in Eswatini.

The extent to which ESE knowledge, skills, and attitudes acquired in TTIs are applied by PSTs in their curriculum practices is intricately linked to curriculum practices in the classrooms where they carry out their teaching practice as part of their teacher preparation. This study was motivated by the need to improve curriculum relevance in TTIs with the intention of promoting constructivist approaches as PSTs were prepared to teach and integrate ESE into their curriculum planning and teaching practices. Environmental challenges in the 21st century, exacerbated by the COVID-19 pandemic, have resulted in a need to realign pedagogical initiatives with multiple patterns of beliefs and practices that provide frameworks through which global environmental challenges can be confronted.

The Decade of Education for Sustainable Development, which is a UN initiative to integrate the principles, values and practices of sustainable development into all aspects of education and learning (UNESCO, 2017a), remains unrealised as we begin the third decade of the 21st century. Howlett *et al.* (2014) argue that real changes in both curricula and pedagogical practice are required in such a way that HE curricula are designed on interdisciplinary grounding and that pedagogical practices are geared towards developing critical and reflective thinkers. As a pre-condition to achieve a sustainable future, HE pedagogical practices that promote creative ways of thinking must be adopted (Alraouf, 2010). New innovative educational approaches need to be designed in such a way that they nurture agency, self-determination, critical thinking, and the ability to apply metacognition. This is the transformative aspect needed to ensure that learners are supported to become change agents that integrate, connect, confront and reconcile multiple perspectives of global challenges that require retooling teaching and learning methods (Wals, 2010). EfS reflects a broadening concept that integrates social, economic and political development concerns that address education for long-term ecological and social sustainability (PCE, 2004; Tilbury, 1995). A re-orientation of thinking towards sustainable development came about as a result of a growing realisation of the inseparability of environmental problems from the actions of human beings (UNCED, 1992).

Blake, Sterling and Kagawa (2013) note that the rising demand for interdisciplinary understanding in relation to sustainability issues exerts direct pressure on traditional disciplinary modes of organisation in HEIs. They further observe that, in spite of programmes which promote interdisciplinarity with regard to sustainability integration being recognised as innovative, there is, in practice, resistance to infusing sustainability into curriculum structures and this results in limited manifestation of sustainability lifestyles. The interfacing between discipline-based university structures and methods and cross-boundary integrative approaches and participatory pedagogies is obscure or absent. Blake *et al.* (2013) caution that the survival and flourishing of interdisciplinary programmes requires support from senior management and that change in teaching and learning policies and practice, in terms of embracing interdisciplinary approaches, takes time to get rooted into structures of educational systems.

Through innovative curriculum practice, which is discussed in the next section, PSTs can be prepared to teach and integrate ESE into their curriculum planning and teaching practices.

3.3.1 Curriculum Practice

A curriculum is not just a practice in constant deliberation and negotiation, but it also includes the interaction between teachers and learners, who are considered to be active participants in the curriculum implementation process (Carl, 2010).

The notion of empowerment of teachers as curriculum agents was raised by Carl (2010), who emphasised the need for teachers to become active role players who are empowered to participate fully in the development of curriculum documents. Marks, Stoops and King-Stoops (1978, in Carl, 2010) define a curriculum as the totality of the means by which learners are guided to construct learning, a process that encompasses all aspects of the learning experiences that learners go through at school. These planned and guided learning experiences are formulated through, as Tanner and Tanner (1975, in Carl, 2010) puts it, the systematic reconstruction of knowledge and experiences in the specific context of any given school to ensure the learners' continuous construction of knowledge. Tanner and Tanner's definition is appropriate for informing this study, because they emphasise reconstruction of knowledge and experience, key elements in ESE mediation that, in Chapter Two, were

shown to be part of constructivist teaching and learning approaches. Research projects, such as this study, should help in creating better understanding of the processes relating to curriculum practice that includes curriculum integration. The increased knowledge in curriculum implementation processes that are discussed in the next section should help to reduce the gap that exists between what is official curriculum policy and what is practised at the micro-level of curriculum implementation. In many HEIs, teacher education knowledge bases, which form the subject matter of education, are still organised as independent subjects or courses to suit the way subject departments operate, yet the real world functions in integrative, collaborative ways. It is, therefore, important to make links explicitly with curriculum knowledge bases of teacher education. Examples of such knowledge bases in TTIs include curriculum and instruction, foundations of education, and educational technologies. With these knowledge bases, teacher education is crafted to promote quality learning by PSTs and to prepare them to cope with the complex nature of the teaching profession (Hoban, 2005).

Rogan and Grayson (2003) remind us that the culture and ethos of an institution influence curriculum practice. The conceptualisation of the whole curriculum process impacts the teaching and learning experiences made available to students. The holistic way to interpret the curriculum process should include the process by which we facilitate student learning. This approach allows us to better reflect on the different roles and responsibilities encountered during knowledge reproduction in the classroom, and it suggests that there is urgent need to progressively widen the scope of what is mediated in ESE. O'Donoghue (2020) also reminds us that much can be learned about the present state of environmental and sustainability issues from the indigenous heritage practices of the past. He advises that connecting with cultural practices can enhance our ability to initiate good sustainability practices and that such connections should be part of the process that enriches curriculum integration discussed in the next section.

3.3.2 Curriculum Integration

Curriculum integration, in its simplest conception, is about making connections to construct learning effectively. The connections are across not only disciplines, but also linkages to real life situations, in relation to knowledge, skills, values and attitudes that

learners require in the classroom. These connections blur the lines between content areas, as teachers embed essential content material into a given curriculum (Drake & Burns, 2004). Integrated curriculum organises educational knowledge as a way of designing teaching and learning that meets learner needs, as learners are encouraged and supported to engage actively in the process of constructing knowledge. This suggests that curriculum integration sets in motion efficient means to enhance collaborative work so that learners may meaningfully utilise similarities and connections between knowledge entities of different subjects (Al-Ramahi, 2015). Curriculum integration requires educators to carefully examine their individual understandings of the purposes and processes of any such curriculum exercise. Integration of CK demands that educators make meaningful connections across different subject areas when they teach (Kendra, Hall-Kenyon & Smith, 2013).

The way we deal with complex and integrated problems and situations in real life is not reflected in knowledge construction contexts that are compartmentalised, guided using a fragmented curriculum. An integrated curriculum demands higher order connections, which stimulate long-term understanding that supports a learner beyond simply accumulating knowledge. Kysilka is accurate when she points out that the 'purpose of education is the making of meaning and that can only occur if the culture of education is so designed as to make that happen' (Kysilka, 1985:209). This then implies that compartmentalisation of pedagogic discourse is a hindrance to Kysilka's (1985) ideal position of the purpose of education.

Teacher educators, such as lecturers at TTIs, are constantly being challenged to teach outside their specialist subject areas. They are urged to plan collaboratively and to demonstrate that they practise what they promote – integrative teaching. Leggett *et al.* say:

> We continue to need the energy to push the boundaries of our teaching,
> to aim for the future while building on knowledge, skills and experience
> grounded in the past (2003:8).

It is a challenging task to promote constructivist approaches to implement ESE integration in TTI curriculum practices. The commitment by lecturers to practise what they teach to PSTs creates the arena in which learning is approached as a shared understanding in the learning construction spaces that need to be actively utilised with

negotiated purpose as resources are exchanged, contextual factors are considered and experience is reinterpreted (Leggett, Lichtenberg, Newhouse-Maiden, & Harvey, 2003).

Since the main aim of this study was to discover the extent to which PSTs at TTIs in Eswatini were being prepared for teaching and integrating ESE into their curriculum planning and teaching practices, curriculum integration was one of the major concepts which framed it. As indicated in the literature study, authors such as Kopnina (2018) and O'Donoghue *et al.* (2018), among others, state that cross-curricular integrating approaches are considered the most appropriate forms of curriculum, both as a process and a product, in which the type of teaching seeks to link different subjects or knowledge areas (Leggett *et al.,* 2003). As such, it can be considered as a form of interdisciplinary teaching, where two or more subjects are taught using shared themes or topics. Proper curriculum integration involves weakening the boundaries between subjects, as students' learning activities are designed to support learners to construct their own learning (Bernstein, 1990).

Curriculum integration, according to Kysilka (1985), may result in merging subjects in such a way that they retain their wholeness, even as they become part of the complete curriculum structure. She further argues that curriculum integration can focus on life experiences of the learner and the needs of a society, reminding us of the way Rogan and Grayson (2003) formulated their constructs to analyse curriculum implementation. Environments that support curriculum integration emphasise authentic learning contexts to ensure that meaning-making processes can take place. Such environments are learner-centred and learner-controlled pedagogical arenas that leverage on learner responsibility and involvement in order to realise results. In such settings, learners determine learning goals and regulate learning activities that guide them to attain desired outcomes. The lack of perseverance and willingness to engage intentionally in constructivist learning is a common obstacle among PSTs to effective implementation of constructivist guided pedagogies (Marra, Jonassen & Luft, 2014).

Kysilka (1985) suggests four curriculum integration approaches to shape knowledge sharing. These are the separate discipline approach, the discipline-based approach, the inter-disciplinary approach and the total integration approach. The separate discipline approach represents the traditional subject-based understanding of the

curriculum. The characteristics of such a traditional classroom, where this approach is used are given in Table 3.1. The literature that has been studied recommends, through authors such as Johnston (2009), that ESE integration is optimally beneficial to learners, if the approaches used are either discipline-based, with inter-disciplinary inclusions, or an integration that is a total-integration model. In Eswatini, I have not yet come across a form of curriculum implementation that adopts the total integration model, where knowledge is treated as one entity with no recognition of subject divisions. Therefore, this study considered Kysilka's (1985) discipline-based approach and inter-disciplinary approach appropriate for offering guidelines for this study to come up with a framework that could be employed by TTIs to enhance ESE knowledge, skills, and attitudes in school curriculum.

The EMoET adopted the inter-disciplinary approach in the latest curriculum reform that shifted to a competency-based curriculum approach (Eswatini Government, 2018). Much of the curriculum practice that I have, over time, observed taking place in TTIs in Eswatini is, however, predominantly the separate discipline approach. This research took the advice of Kysilka (1985) that the success of a particular integration approach predominantly depends on contextual settings in which the integration model is applied; in this investigation, the research did not consider one model to be better than another but instead, preferred to analyse existing models based on the contexts in which they were applied.

The views of Lotz-Sisitka (2020) on climate change are another reminder of the importance of curriculum integration. She points out that climate change is an issue that touches on science, politics, development, and management and she adds that these aspects of humankind have produced so much debate, as they tackle ethical aspects of our lives that demand pro-environmental actions to confront all the challenges that make life risky for all living things on earth. Actions relating to ESE, such as climate actions, should be owned by educational institutions, such as schools and TTIs, in such a synchronised way that ensures that the curriculum and management systems and operations all work together as part of the community of practice where the truth on environmental and sustainability issues is taught and defended.

Chikunda (2020), too, reminds us of the 2016 Global Education Monitoring Report that pointed out the need for teacher education to integrate SDGs into their curriculum structures so that both pre-service and in-service teachers are supported to understand and implement ESD. He additionally argues that the quality of HE curriculum practices accessible to most teachers has not empowered them to adapt sustainably to mitigate and cope with, the complexity of environmental and sustainability issues. Project-based transformative methodologies, promoted by Chikunda (2020), seek to empower teachers and teacher educators in their curriculum practices, as sustainability principles are integrated into education and training environments to improve the teaching and learning experience so that transformative learning pedagogies are responsive to Africa's sustainability development concerns and challenges.

The curriculum integration models for the 21st century compel us to break away from text, time and place, more so because of the COVID-19 pandemic. HEIs must constantly engage in exploring integrative pedagogical options that not only are transdisciplinary, but also options that guarantee the promotion of co-constructivist, learner-centred, learning-led knowledge construction experiences that are immersed in real-world contexts and that make use of multi-modal pedagogical resources, all of which are part of evolving technologies (Hedberg & Stevenson, 2014).

The new ways of delivering learning construction resources are, predominantly, on-line blended approaches that promote interaction and feedback without the need for physical space or physical contact. Digital education and Information and Communication Technologies (ICTs) are key to effective ESD implementation, in terms of strategic innovation, pedagogy renewal, teacher training, inclusive school development and partnership with other actors of sustainable development. The education system must be engaged in intense pedagogical and organisational transformations in order to enable education to deploy its transformation capabilities in the various programmes related to sustainable development by optimising and modifying existing pedagogical practices as digital technologies are infused into their structures. Pedagogical principles of teaching and supporting student learning must be applied to the design and development of online or web-based modules, courses and programmes of study (Ricard & Burgos, 2020). The integrated model curriculum approach focuses on collaborative and synergistic efforts so that integration may be

achieved across learning programmes. Such models support institutions to transition to EfS (Desha & Hargroves, 2014). Such a transition enables ESE to be positioned and aligned in favour of learners, as the next section explains.

3.3.3 Positioning ESE in the Curriculum

As mentioned earlier in Section 2.3 of this study, the concepts of sustainability and environmentalism are developmental concepts that possibly existed before the 18th century. In Section 2.6, it was mentioned that the collective hybrid word ESE, as used in this study, was a combination of the concepts of EE, ESE, SE and Sustainability, and this highlighted how environmental, societal, political and economic concerns are interconnected. Sustainability is a dynamic process characterised by narratives that guide our participation in the protracted, transforming life-sustaining processes, in which we are immersed, not only in the present, but also in the future. Sustainability dynamics entail a regenerative human culture that is capable of helping to sustain the wellbeing of planet earth, as humankind learns how to participate appropriately to support the resilience and health of earth's life supporting systems. Sustainability creates and maintains suitable conditions, under which humans and nature can co-exist. As a result, systems that balance social, economic and natural resources are created to serve present and future generations. To that effect, pedagogical practices applied during ESE mediation should help learners and teachers to pay close attention to the quality of connections in all life-supporting systems on which humankind depends. Effective integration of sustainability in HEI curriculum practices involves incorporating principles and concepts that provide a lens for the construction of ESE knowledge in different academic disciplines. Some of the concepts that are infused to provide such a lens include, among others, diversity, ecological health, interdependence, resilience and ethics (CCES, 2014; Wahl, 2016).

This study focused on exploring educational realities about ESE in TTIs in Eswatini. To date, there are many interpretations of sustainability that make it difficult to integrate appropriately such a broad concept in established curriculum settings (Alraouf, 2010). The process of implementing ESE into HEIs is, indeed, a representation of the expressions of what should take place in the construction of learning during ESE mediation. PST education in TTIs requires a diversity of perspectives and experiences that are globally benchmarked to meaningfully position

ESE in educational discourse. In seeking to highlight the value of ESE in educational discourse, key elements of sustainability about humankind point to the fact that environmental and sustainability issues extend beyond ecological concerns to include social, economic and political matters that directly affect humans and their environment (IUCN/UNEP/WWF, 1991). Ultimately, HEIs need, not only to integrate sustainability into the curriculum structures, but also to integrate it into community outreach, partnership and service, student opportunities and institutional mission and structure (Alraouf, 2010).

This study explored the extent to which educational discourse had incorporated content that supports developing pro-environmental attitudes as PSTs are prepared for teaching and integrating ESE. It further explored the contextualisation of the SDG discourse in TTIs to gauge how PSTs have contributed to the 2030 UNGA. Sustainability needs to be contextualised at all levels of curriculum implementation in such a way that education systems are able to establish a correlation between what teachers know and their ability to implement SE in educational institutions, such as schools and TTIs (Loubser, 2011). Sustainability in education, then, translates to transformative learning processes that, according to Cloud (2016), can empower learners, educators and educational systems. These processes equip such systems with new knowledge, skills, values, and attitudes that are needed to improve sustainably the quality and standard of life in a context of restoring the well-being of all living systems on planet earth (Cloud, 2016).

The global state of the environment adds urgency to any attempts associated with ESE implementation because, as was earlier mentioned in the introduction to this study in Chapter One, education has a catalytic impact on the well-being of individuals and the future of our planet (UNESCO, 2017a). For example, reversing the levels of degradation on earth's life supporting systems requires engaging education systems in the sustainability discourse (Tbilisi Declaration, 1977). The practice of ESE in Eswatini TTIs is a question of institutionalisation of the ESE discourse that should be viewed as a viable entity in all educational settings. In the next section, this viability is discussed.

3.3.4 The Viability of TTIs as ESE Mediation Spaces

TTIs, as HEIs, should be spaces that catalytically stimulate progress in the education system to ensure that PSTs are adequately prepared to teach and integrate ESE into their curriculum planning and teaching practices.

TTIs should function as bases that are endowed with communicable ideas that are more often in the form of new knowledge that is generated through research. Such knowledge should be shared and utilised through different educational programmes. The mission and functions of HE, according to Strachan *et al.* (2019), include undertaking research, community engagement, educating and training, and, among others, developing innovative educational approaches that support creativity and critical thinking. As a faculty member in an HEI, the researcher of this study has participated in research, teaching, and community engagement as part of the endeavour to contribute to a sustainable future. More than ever before, as we begin the third decade of the 21st century, it is clear that HEIs need to re-conceptualise their current roles and the degree of viability in the context of prevailing global challenges, especially those on climate change in the COVID-19 global pandemic era (SARUA, 2014; Levesque & Wake, 2021). The effectiveness of TTIs, as HEIs, partly depends on their degree of openness to new ideas and practices, as they are exposed to new forms of learning.

Ashwin and Case (2018) explored the transformative nature of HE and attempted to discover the extent to which undergraduate education supported the public good through the production and dissemination of knowledge that leads to the promotion of ESE. They note that the idea of HE serving humankind is inseparably linked with their ability to generate transformative initiatives that, in most cases, are realised through teaching. Yet, as pointed out by authors, such as Mulá *et al.* (2017) and Ates and Gül (2018) in Sections 2.5.1 and 2.4.1 respectively of this study, HEIs are not yet fulfilling this ideal as expected. Schendel (2018), also argues that HEIs lack transformational pedagogies that are known to inspire students, such as the PSTs who were investigated in this study. It is, therefore, very important to understand how institutions, such as TTIs, ought to develop new institutional cultures to be able to grapple with the challenges of pedagogical transformation that, in this study, focused on exploring educational realities about ESE in TTIs in Eswatini in the context of determining the

extent to which PSTs were being prepared to integrate ESE knowledge, skills and attitudes into the Eswatini school curriculum.

A theoretical understanding of the relationship between institutional cultures and pedagogical change is best supported using empirical findings found in published literature. The lack of such literature limits understanding of how assumptions around knowledge curricula content and relationships within classrooms can serve to promote or impede pedagogical transformation in institutions, such as TTIs. There is, nevertheless, sufficient literature that acknowledges the pivotal role institutional cultures play to influence pedagogy positively (Schendel, 2018), as will be discussed in the next section.

3.3.5 Pedagogy and ESE Mediation

Pedagogy refers to any conscious activity by one person that is designed to enhance learning in another person in the form of a sustained process to acquire new forms of conduct, knowledge, practice and criteria (Bernstein, 2000; Watkins & Mortimore, 1999). Whereas the visible pedagogies involve teachers who explain to learners what and how they will learn, the invisible pedagogies are the informal approaches where the teacher responds to the individual needs of learners (Bernstein, 1990). Alexander's (2001) definition of pedagogy, which is considered to be encompassing social cultural and political aspects, focuses on teachers' beliefs. He points out that pedagogy comprises of teachers' ideas, beliefs, attitudes, knowledge and understanding about the curriculum and how these will influence the teaching and learning experience that are observable in the classroom. The specific actions and discourses that take place within a lesson physically and that enact the approach and strategy applied, are referred to as teaching practices in class by Alexander (2001). These practices, he explains, are the teachers' spoken discourse, visual representations, and a variety of social interactions that include providing tasks and monitoring the progress of learners. Effective pedagogy occurs when the pedagogical measures that are taken produce observable changes in learners and result in greater measurable participation (Westbrook *et al.,* 2013). Of special note, in relation to this study, is the observation by Westbrook et al. (2013) that constructivist approaches were the most frequently cited theoretical frameworks and were also highlighted as the best form of promoting curriculum innovations.

Pedagogic practice is developed through interaction with teachers' thinking that is guided by their values and attitudes – what they do in the classroom and what they envision as the outcome of their practice. Effective pedagogic practice is best realised when teachers have not only a positive attitude towards their training, but also a positive attitude towards their students. These attitudes promote learning, which is collaborative, interactive and communicative and where there is appropriate feedback from learners. In this way, learners are given the opportunity to engage, to understand, to participate and, eventually, to construct learning (Westbrook *et al.,* 2013).

Pedagogies that respond meaningfully to environmental and sustainability issues emphasise contextualisation, collaboration, embracing complexity and the practice of metacognition. Such pedagogies place much value on the importance of place and grassroots practices, which Bernstein (1990) refers to as curriculum reproduction fields. In these settings, individuals purposefully work together to tackle sustainability and environmental issues and are aware of the tensions ingrained in such contextual settings that are known for promoting trans-disciplinary fields. It is such curriculum practices that accommodate divergence among learners and that constantly ensure that there is room for unanticipated, yet positive, possibilities to emerge (Prescott, 2018).

HE pedagogical practices need to embrace new pedagogies, such as action learning promoted by Taylor (2020), who points out that such a form of learning is inclusive, practical and engaging, a type of learning construction that is more transactive than transmissive. In such knowledge reproduction fields, environmental and sustainability issues of concern form the starting point of knowledge construction, as teachers and learners work collectively to plan lessons. The dialogue about topics of concern becomes enriched with meaningful talk, once everyone is tuned into the learning action process. Also, learners are supported to think, reflect and revise, as they carefully focus on the topics and tasks at hand. As teachers as well as learners stay connected to all that takes place in the field work, meaningful participation translates into lived experiences of actions, which support the wellbeing of the environment, as well as sustainable living (Taylor, 2020).

More new curriculum programmes are emerging out of the need for curriculum renewal. A good example is the ESD learning processes framework, a combination of

methods and content that encourages learners to question unsustainable development patterns. Such learners, simultaneously, seek innovative solutions to prevailing and emerging issues that can be resolved through practising sustainable lifestyles that guarantee a sustainable future. The ESD frameworks thrive in constructivist grounded curriculum programmes that are linked to the lives of learners in their local communities (Mandikonza & Lotz-Sisitka, 2020).

Promoting sustainable development pedagogies requires adopting a multi-disciplinary and holistic approach, encouraging teamwork, promoting creativity and innovation, and developing critical and systems thinking in students. Unfortunately, in many instances, the teaching staff lacks exposure to such an approach. Learning through understanding, analysis and inquisitiveness is still lacking in many learning institutions such as TTIs (Mohamedbhai, 2014).

Embedding sustainability supporting pedagogic practices, as a form of HE curriculum renewal, translates into sustainable development of knowledge, skills and values and into getting infused in curriculum settings. This is a sure way of advancing the kind of thinking, teaching and research that accelerates the desired shift in the cognitive set up, from critical thinking to action-driven thinking that yields sustainable abundance for humankind. The call for lifelong learning is blurring the boundaries among schools, HEIs, communities and the private sector, such that this emerging dynamic is also providing new energy and creativity in teaching and learning for sustainability (Rowe, 2014).

This study, in part, attempts to influence transformation of pedagogy within the TTIs that prepare PSTs in Eswatini for teaching and integrating ESE into their curriculum planning and teaching practices. To that effect, this study analysed institutional culture and academic behaviour from data that were collected through interviews. HEIs can be both reproductive and transformative, reproducing the desirable norms of society, while, at the same time, shaping that what society ought to become in the future (Walker, 2015).

For systemic change to be realised, there is a need to align proper curriculum knowledge and pedagogic practices, because competing discourses in support of curriculum rebirth are manifested in the forms of many policies that are produced to influence practice. Ultimately, curriculum, in a well-positioned TTI, is central to a

transforming experience that adequately prepares students for the challenges of a rapidly changing workplace (Shay & Mkhize, 2018). HEIs are rapidly transforming themselves in order to utilise ICT services, that is, they are increasingly relying on online delivery of education, which is well-defined, well-planned and well-supported. Research, teaching and outreach, as academic practices within the pedagogic discourse, are aligning with the needs and expectations of evolving educational systems.

3.4   CHAPTER SUMMARY

The theoretical and conceptual aspects discussed in this chapter form the setting that influenced and shaped this study. The first part of the chapter discussed the theoretical elements which framed this study and in it are three sets of theories. The constructivist theories were discussed in the context of being applied in order to prepare PSTs for teaching and integrating ESE into their curriculum planning and teaching practices. Bernstein's three constructs of classification, framing and re-contextualisation were then introduced as concepts that provided guidelines to the process of designing analytical tools that this study used to analyse curriculum documents and curriculum practices to determine the extent to which PSTs were being prepared to integrate ESE knowledge, skills and attitudes into the Eswatini school curriculum.

The concepts of classification and framing provided a language that the study could use to express the different extent of ESE integration that was encountered. Bernstein's theory of re-contextualisation was used to explain ESE implementation in recontextualised pedagogical texts. Rogan and Grayson's Theory of Curriculum Implementation formed the third component of the theoretical framework and provided the guidelines to investigate how the physical contexts of TTIs influenced ESE integration as PSTs were prepared for teaching and integrating ESE into their curriculum planning and teaching practices.

In the second part of the chapter, curriculum practices as one of the major concepts that framed this study were discussed. This provided clarity on current curriculum thinking and practices linked to ESE mediation. The need to promote ESE integration is established in the need to provide teaching and learning experiences which are relevant to humankind. The chapter then looked at the integration of knowledge from

different disciplines into pedagogical processes in the context of implementing cross-curricular ESE mediation. The main concepts, including curriculum practices and teaching practices to prepare PSTs for teaching and integrating ESE, framed the main research question of this study. This framing ensured that the research questions used in this study were relevant and laid a firm foundation for the process of collecting both qualitative and quantitative data. The theoretical framework was designed to ensure that all data collected provided a rich source of new knowledge.

The next chapter elaborates on the research process that was followed in an attempt to answer the main research question that sought to establish how PSTs in Eswatini were being prepared for teaching and integrating ESE into their curriculum planning and teaching practices. The chapter describes research methodology, which includes the research design, the research methods, the measures of trustworthiness and the ethical measures that are employed in this study.

CHAPTER FOUR
RESEARCH METHODOLOGY

4.1   INTRODUCTION

The main aim of this study was to establish the extent to which PSTs at TTIs in Eswatini were being prepared to integrate ESE knowledge, skills and attitudes into the Eswatini school curriculum.

The study sought to generate empirical data on the way ESE is acquired by PSTs and to highlight how ESE knowledge, skills and attitudes are applied by PSTs in their curriculum practices in Eswatini. In Chapter three, the theoretical and conceptual frameworks for this study were presented. This chapter discusses research methodology that incorporates the research design, research methods, measures of trustworthiness and ethical issues that were applied in this study. The chapter explains the paradigmatic assumptions which helped to organise the actions that were taken during the research process regarding research strategies for data generation and analysis.

The chapter also explains how analytical tools were designed to generate data on the extent of ESE integration into PSTs curriculum practices in Eswatini. Curriculum documents, curriculum activities and curriculum practices were analysed. The chapter further gives details on strategies for ensuring quality in my research work and ends with a discussion of ethical issues that were addressed in this study.

Research methodology refers to choices regarding data collection methods and techniques and the choice of how to analyse collected data. Theoretical assumptions and principles in the choices guide a researcher in systematically approaching the research process to address the research problem (Bairagi & Murrot, 2019; Kothari, 2004; Pruzan, 2016).

This study, which focused on exploring the extent to which PSTs at TTIs in Eswatini were being prepared for teaching and integrating ESE into their curriculum planning and teaching practices, presents a set of issues requiring not only in-depth investigation of a small number of participants, but also exploring aspects of preparing PSTs for teaching and integrating ESE into their curriculum planning and teaching

practices using a large number of respondents. This could best be undertaken by using a MMR design. Figure 4.1 gives a diagrammatic presentation of the research methodology used in this study.
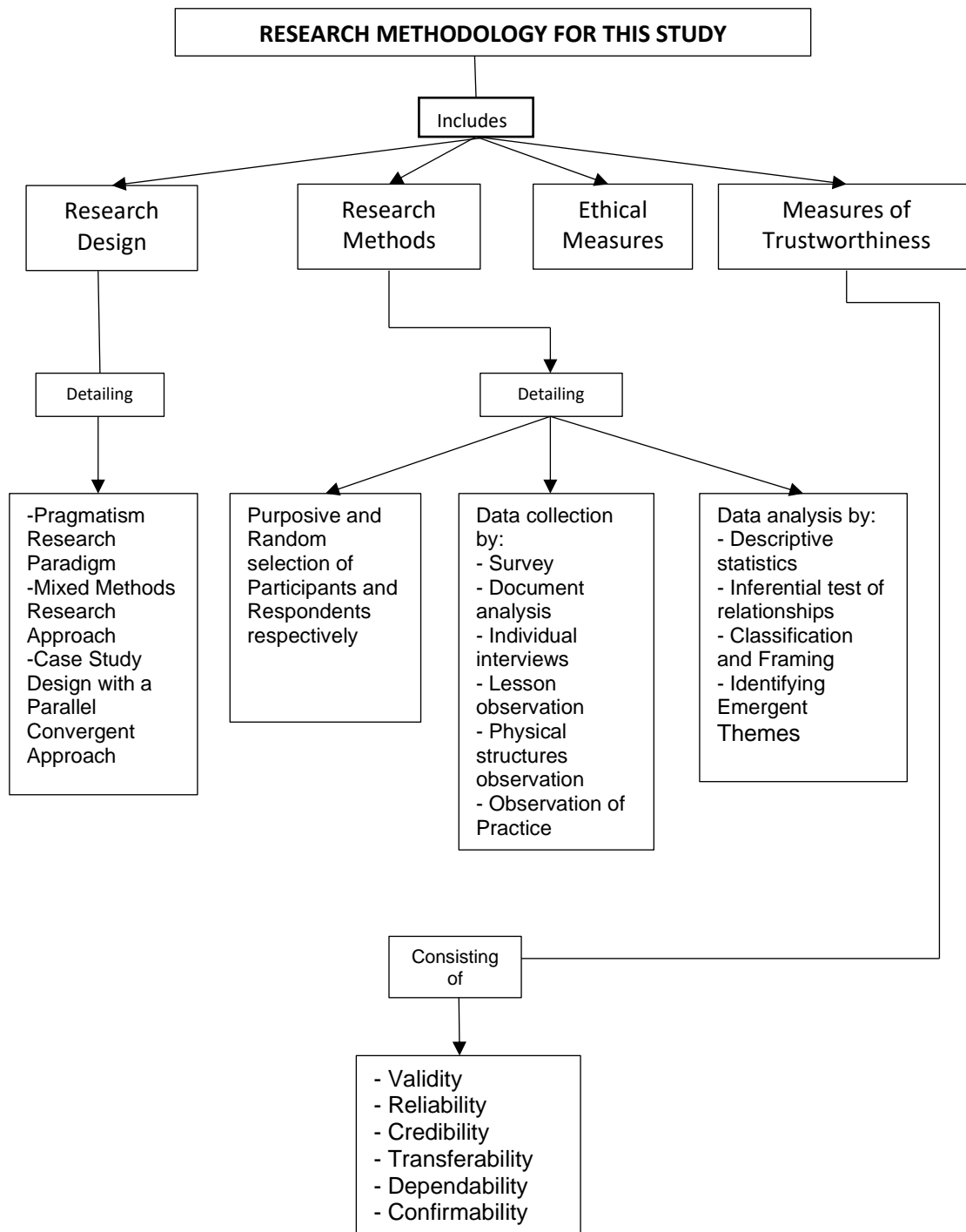
Figure 4.1: The research method for this study

In the following section, my rationale for the choice of methodology is discussed.

4.2   RATIONALE FOR EMPIRICAL RESEARCH

Empirical research, a way of gaining knowledge by means of direct and indirect observation and experience, relies on systematic investigation and uses verifiable evidence to arrive at research outcomes. Accurate analysis of data using acceptable strategies is critical in determining the trustworthiness of such research. The facts obtained from empirical research form a legitimate source of endurance and offer firm grounds for formulating effective strategies to come up with lasting solutions. Evidence-based practice and principles stipulate that decisions should be based on research-based knowledge collected in a systematic way, using recognised scientific standards that enable knowledge to be synthesised from multiple sources and perspectives (Creswell & Creswell, 2018; Cohen *et al.,* 2018; McMillan & Schumacher, 2014;).

In order to establish the extent to which ESE knowledge, skills and attitudes acquired in TTIs are applied by PSTs in their curriculum practices in Eswatini, I relied on evidence obtained through empirical data collection methods. In my literature study that is recorded in Chapter Two, I found limited information on how ESE issues were integrated in the teacher education curriculum practices in Eswatini when PSTs are being prepared for the field of work. Therefore, the new knowledge I sought to generate needed to be based on conclusions that are exclusively derived from concrete, verifiable evidence.

The empirical research based on direct observation is a proper way to measure reality and to generate truth about the alignment between what PSTs claim to know and what they practice both as individuals and also as educators. My empirical research findings were aimed at validating previous research findings and needed a high degree of control to manage the many variables involving both participants and respondents. It was only then that my findings would have the potential to influence policy and practice decisions in Eswatini would be deemed genuine. The nature of my main research question (see Section 1.5.1) is such that it can best be answered by applying mixed methods empirical research. This is in line with Tilda's (2000) observation that the experience and observation unique to each moment and for each individual are situated in the cognitive processes of the researcher and the research subjects.

Molina-Azorin and Fetters (2019) remind us that credible knowledge is created through carefully executed research so that such knowledge is relevant and actionable for practitioners. Such research, they add, is socially engaging and has the potential to solve societal problems. Through an appropriate combination and integration of qualitative and quantitative methods that constitute what Molina-Azorin and Fetters (2019) call a complete methodological kit, I was able to develop credible and useful knowledge.

Because empirical research relies on scientific data collection methods to generate empirical data (Cohen *et al.,* 2018), the intricate, credible and complex research that I carried out laid a solid foundation on which to base the interpretation of data to be generated. This study attaches great value to the contextual framework that provides documented literature of global and local practices highlighting approaches to the integration of ESE into HEIs curriculum practices. The contextual settings within which TTIs in Eswatini prepare PSTs for teaching and integrating ESE into their curriculum planning and teaching practices were a valuable reference point during the stage of developing interview questions, the questionnaire and observation schedules.

The theories and key concepts that constituted the theoretical and conceptual frameworks influenced and shaped this study in that the main concepts including curriculum and teaching practices to prepare PSTs for teaching and integrating ESE, framed the main research question of this study and ensured that the research questions that I selected were relevant in laying a firm foundation for the process of collecting empirical data.

4.2   RESEARCH PARADIGM

Research paradigm as used in the context of research methodology refers to the basic belief system or worldview that guides empirical research by representing a world view that defines the nature of the world, the individual's place in the world and the range of possible relationships to that world and its different parts (Guba & Lincoln, 1994). Kuhn (1962, in Cohen *et al.,* 2018) defines a paradigm as a combination of practices that define a scientific discipline to deal with a specific situation in relation to what is to be explored in an empirical undertaking. He further notes that paradigms encompass how we look at the world, the conceptual frameworks in which we work to

understand the world, what counts as relevant knowledge and how we validate and consider that knowledge.

Understanding philosophical perspectives of empirical research is necessary because comprehending what frames research methodology, influences most of the choices that are made to answer research questions. The personal thoughts and beliefs of a researcher contributes to shaping the total research design in a study (Moon & Blackman, 2017). The domain of philosophical assumptions and stances that I present in the next section guided and justified the way I thought about my research work that was underpinned by ontological and epistemological assumptions. These assumptions formed the underlying theoretical approach to this study, starting with formulating the main research question, selecting research strategies and methods to the stage when data were collected and analysed. Key decisions taken in framing the research methodology for this study were based on philosophical principles that guided my theoretical thinking and self-awareness. Existing knowledge available in a field of empirical research plays an important role in determining the world view chosen by a researcher to approach his or her research work and ultimately shaping the research paradigm for such a study.

4.2.1 Paradigmatic Assumptions

The philosophical assumptions within which I conducted this study are lenses through which I examined my research practice (Creswell & Creswell, 2018; Cohen *et al.,* 2018). Outlined in the next section are ontological and epistemological assumptions that underpinned my research work.

(i) Ontological assumptions

Ontological assumptions are views about the nature of reality entailing what individuals think about themselves and their surroundings. The nature of reality in the teaching and learning context includes the individual's principles, values and habits (Creswell & Clark, 2018; Cohen *et al.,* 2018; Creswell & Creswell, 2018).

This study adopted the view that all individuals are unique. As a result of their peculiarity, individuals relate differently with one another and so they have different types of judgement and actions within their surroundings. Therefore, in this study, I considered the nature of reality and what is real to be both singular and multiple

realities that can be observed. To that effect, in this study, the prevalence of ESE knowledge among 211 PST respondents was considered and handled as a single reality that I explored using a questionnaire (see Section B of the questionnaire, Appendix E). I was thus able to test hypotheses formulated from the quantitative data collected.

The second single reality that I investigated in this study was whether or not pro-environmental attitudes existed among PSTs (see Section C of the questionnaire, Appendix E). I also explored multiple forms of the reality relating to the extent to which ESE knowledge, skills and attitudes acquired in TTIs are applied by PSTs in their curriculum practices in Eswatini. These multiple realities of individuals can also be observed through narrative data collected from participants and what they are able to demonstrate in socially mediated contexts such as teaching. Multiple realities can also be observed by studying and analysing what is written down in curriculum documents such as course outlines.

In order to explore multiple forms of reality, I conducted document analysis, in-depth interviews, lesson observations and field observations of the built physical structures, grounds and their surrounding areas as part of observations in practice. This study therefore assumes the participants' personal understanding of themselves and their context so as to be able to help reveal the extent to which TTIs in Eswatini prepare PSTs for teaching and integrating ESE into their curriculum planning and teaching practices.

(ii) Epistemological assumptions

Epistemological assumptions deal with what counts as knowledge, that is, the nature of knowledge and the relationship between what can be known, the knower and the researcher (Guba & Lincoln, 1994). In other words, epistemology is concerned with all aspects of the validity, scope and methods of acquiring knowledge, implying that epistemological assumptions influence the way researchers frame their research in an attempt to find knowledge. Objectivist epistemology assumes that reality exists outside the knower and is independent of the individual mind. This aspect of research is useful in guaranteeing consistency of results obtained, that is, the reliability of the results and their applicability to other contexts, an aspect referred to as external validity. On the other hand, constructionist epistemology assumes that truth and what can be known

is found in our experiential interactions with our surroundings. Subjective epistemology relates to the idea that reality can be expressed in many ways to fit the purposes of the knower. The value of subjectivist research is in revealing how experiences of an individual shape their perception of the world (Moon & Blackman, 2017).

The epistemology guiding this study is based on practicality. As argued by Morgan (2020), what gives meaning in MMR is the consensus of the research community. If the methods prescribed in the methodological choice help to answer the research question, then that epistemological position is acceptable because it works. Morgan (2020) further adds that the mixing of methods means mixing broad and different ways of knowing which leads to better knowledge produced in an empirical study. Lynch (2014) then advises that ways of knowing are so inherently flawed that only provisional consensus should be acceptable in specific circumstances when empirical research takes place.

Consequently, in this study, in order to adequately deal with 211 students, I used a questionnaire to objectively collect data in a practical and realistic way in order to gauge how much PSTs know about environmental and sustainability issues and how this knowledge has influenced their attitudes. On the other hand, I applied subjectivity by working closely with 15 carefully selected participants as I conducted face-to-face interviews to complement other qualitative data collected through document analysis, lesson observations, field observations and observations in practice.

4.2.2 Pragmatism

Creswell and Creswell (2018) define world views as a general philosophical orientation about the world and highlight Post-Positivism, Constructivism, Transformativism and Pragmatism as four key world views that guide empirical research. Pragmatism views knowledge as an indispensable reality and a detailed experience. Existing truth, implications and the boundaries of knowledge are temporal and can be changed, modified or altered overtime (Bashir, Syed & Qureshi, 2017). I applied pragmatism and focused on the research problem and research questions by using both quantitative and qualitative research approaches to determine the extent to which TTIs in Eswatini supported the integration of ESE into teacher education curriculum practices. By applying pragmatism, I embraced both quantitative and qualitative

assumptions, aspects of research that Creswell and Creswell (2018) refer to as pluralistic approaches.

As indicated in the title, the aim and objectives of this study, I considered the pragmatic worldview as the best point of view for this study because I collected data from multiple sources in order to relate the different units on which I focused, these being: TTIs, PSTs, Lecturers, Institutional leaders and stake holders linked to environmental and sustainability issues in Eswatini. The pragmatic worldview guided my actions while using two approaches for collecting and analysing data to best understand how TTIs supported the integration of ESE into the teacher education curriculum practices in Eswatini as PSTs are being prepared for teaching and integrating ESE into their curriculum planning and teaching practices.

In this study, the purpose of mixing quantitative and qualitative data is firstly to be able to interact in a detached manner with many PSTs in order to gauge not only their levels of understanding of ESE matters, but also to establish the extent to which they may have developed pro-environmental attitudes as they are being prepared to teach and integrate ESE into their curriculum planning and teaching practices. Secondly, I needed to conduct in-depth face-to-face interviews with 15 carefully selected participants that have been purposively sampled on account of their being knowledgeable enough to help answer the research question. The qualitative data were collected not only from 15 participating interviewees, but also through document analysis, lesson observations and field observations that formed part of what I observed in practice. It is out of this, referred to by Creswell and Creswell (2018) as social context that I was able to successfully collect valuable data that were later analysed.

The main research question for this study, (see Section 1.5.1) was central and critical to my decision to apply MMR because answering the research questions required what Hesse-Biber and Johnson (2013) refer to as plural methodologies, cross-disciplinary approaches and multiple philosophical perspectives. I applied the mixed method approach to all the stages and areas of this study including the philosophical foundations that secured methodological alignment, as Figure 3.5 clearly illustrates. I therefore focused on framing and answering the research question by applying what worked in the whole design and methods to be utilised to collect and analyse data. I

applied both inductive and deductive reasoning to investigate both the singular and multiple views regarding how the knowledge, skills and attitudes PSTs acquired in TTIs were applied in their curriculum practices. By making explicit the philosophical ideas I espoused in this section, the reason for using MMR as a research approach become even clearer. The pragmatic approach answers the research questions and delivers useful practicable, reliable and valid answers to establish how the knowledge, skills and attitudes PSTs acquired in TTIs were applied in their curriculum practices. By opting for the pragmatist paradigm, I was able to draw on and integrate both numeric and narrative approaches not only using quantitative research approaches but also qualitative ones in form of MMR discussed in the next section.

4.3   RESEARCH DESIGN

Research designs are procedures of inquiry in which we find research approaches that specifically guide a research study (Creswell & Creswell, 2018). Such procedures are presented in the form of a plan that is drawn up to organise the research and to make it practicable to answer research questions based on empirical research evidence (Cohen *et al.,* 2018). As pointed out by Labaree (2013), a research design consists of the overall plan of action that a researcher deploys to integrate different elements of his or her study in a logical and coherent way. In so doing, the researcher ensures that the research problem is addressed through the collection, measurement and analysis of data. This implies that a general set of research aims and objectives can be translated into a practical researchable topic (Cohen *et al.,* 2018; Creswell & Clark, 2018; Labaree, 2013). The use of inductive and deductive logic of inquiry in the same study permits researchers to simultaneously tackle theory generation and hypothesis testing (Bashir *et al.,* 2017).

In this study, the collective narrative of the procedures for carrying out my empirical research study utilised pragmatism that guided the mixed method research approach that I applied. The research strategy that was used is a MMR Instrumental Multisite Case Study. Since the purpose of this study is to discover the extent to which PSTs were being prepared to integrate ESE knowledge, skills and attitudes into the Eswatini school curriculum, I chose pragmatism as the guiding paradigm because it is practical, action-oriented and can be applied to find solutions to existing problems and issues

given the fact that it deals with realities based on practical considerations (Kalolo, 2015).

Using a quantitative method to explore a large number of respondents' knowledge levels and the prevalence of pro-environmental attitudes would not be sufficient to provide complete answers of how PSTs applied ESE knowledge, skills and attitudes in their curriculum practices in Eswatini. There is a need to add a qualitative method in order to gain an in-depth understanding of ESE issues from carefully selected participants. Therefore, by using a MMR approach, I was not only able to investigate single realities linked to PSTs but also multiple realities relating to ESE integration and ESE mediation as part of ESE curriculum practices. With the mixed methods, I was able to get data from many sources to effectively explore the extent to which TTIs in Eswatini prepared PSTs for teaching and integrating ESE into their curriculum planning and teaching practices. The sources of data not only included 211 students meant to provide a general understanding of the levels of ESE knowledge and the prevalence of pro-environmental attitudes but was also made up of narrative data from 15 carefully selected participants, curriculum document analysis data and data obtained through observation of lessons, practices and physical structures.

The overall plan of action mentioned above, clearly shows that not only did I purposely aim to discover what was happening in Eswatini regarding integrating ESE into the PSTs curriculum planning and teaching practices, but I also wanted to establish reasons why existing practices were in place. My research design in the end ensured that the evidence I obtained enabled me to effectively address the research problem logically and as Labaree (2013) puts it, as unambiguously as possible.

In this study, as Labaree (2013) points out, I thought critically about what information was required to address the research problem and therefore addressed the key design issues beforehand to ensure that the overall validity of this study was not compromised. According to Creswell and Creswell (2018), methodology encompasses the analysis of the plan of action of empirical research and is intertwined with the philosophical considerations of Ontology and Epistemology discussed in the next sections that have detailed my research paradigm, research approach and research strategy.

4.3.1 Research Approach

Research approaches are plans involving many decisions that a researcher puts together to guide a methodological path to be taken so that data collection, data analysis and data interpretation are done systematically and efficiently (Creswell & Creswell, 2018).

In general terms, MMR is defined as a research approach that combines both qualitative and quantitative research approaches enabling a researcher to operate not only across methodological techniques, but also epistemological perspectives. The natural limits of using either qualitative or quantitative research approaches alone have compelled researchers to utilise MMR where both data collection techniques and data analysis are considered from multiple perspectives (Small, 2011). MMR is not simply about mixing qualitative and quantitative research techniques within one's study but includes the purposeful integration and synthesis of data from both approaches so that a multifaceted understanding of a phenomena is realised (Doyle, Brady & Byrne, 2016). Creswell and Creswell (2018) define MMR as an approach in which the researcher collects, analyses and interprets both qualitative and quantitative data, integrates the two approaches in various ways and frames the study within a specific design. MMR constitutes a way of looking at the social world that is informed by a pragmatic paradigm of practicality in answering research questions.

Creswell and Clark (2018) note that debate relating to MMR has continued even as different researchers endeavour to clarify aspects of its applicability and add that as more people choose the MMR mode, methodological tensions have continued to rise. Maxwell (2011), for example, argues that it is neither appropriate nor useful to attempt to synthesize different philosophical assumptions into a single, logically consistent paradigm for MMR. He further notes that different situations and research problems may not only require different sets of assumptions, but also different combinations of methods. Onwuegbuzie and Leech (2005) had earlier noted that MMR recognises the fact that there are many similarities in qualitative and quantitative research approaches. Both approaches for example use observational data to make inferences on why observed outcomes turn out the way they do.

As a problem-centred approach in empirical research, MMR uses methods and theories instrumentally by making use of whatever works best in a given study (Leavy,

2017). Just as Leavy (2017) observed, I found MMR approaches appropriate for this study because my research problem required me to describe, explain and evaluate complex issues relating to preparing PSTs in Eswatini for teaching and integrating ESE into their curriculum planning and teaching practices.

With the research question already formulated, I carefully selected the methods of how I conducted my research to answer the research question realising that only the mixed methods could offer acceptable and effective steps that would lead to solving the research problem. Therefore, convergence and completeness justified using the mixed methods design as qualitative and quantitative methods complemented each other such that findings were mutually corroborated to provide a more comprehensive account of the extent to which PSTs in TTIs in Eswatini were being prepared for teaching and integrating ESE into their curriculum planning and teaching practices (Doyle *et al.,* 2016). The integration just mentioned would lead to the creation of new knowledge that, in the words of Creswell and Clark (2018), would not be obtained easily by separately applying either qualitative or quantitative research approaches.

Since I was not limited to a mono-method approach of enquiry, my research questions not only tackled single realities but also multiple ones. As already explained in Chapter One of this study (see Section 1.7.1.2), I used a concurrent triangulation design also known as a convergent parallel design where both qualitative and quantitative research approaches were apportioned equal priority. There was simultaneous but independent data collection and data analysis. Later, results were merged to provide a more complete understanding of the preparation of PSTs for teaching and integrating ESE into their curriculum planning and teaching practices. Figure 4.2 is a diagrammatic presentation of the Mixed Methods Case Study design with a Parallel Convergent Approach.

```
┌─────────────────────┐        ┌─────────────────────┐
│  Design the         │  ┌───┐ │  Design the         │
│  quantitative       │──┤and├─│  qualitative        │
│  strand             │  └───┘ │  strand             │
└─────────────────────┘        └─────────────────────┘
          │ ┌────┐                       │ ┌────┐
          │ │then│                       │ │then│
          ▼ └────┘                       ▼ └────┘
┌─────────────────────┐        ┌─────────────────────┐
│  Collect the        │  ┌───┐ │  Collect the        │
│  quantitative data  │──┤and├─│  qualitative data   │
└─────────────────────┘  └───┘ └─────────────────────┘
          │ ┌────┐                       │ ┌────┐
          │ │and │                       │ │and │
          ▼ └────┘                       ▼ └────┘
┌─────────────────────┐        ┌─────────────────────┐
│  Analyse the        │  ┌───┐ │  Analyse the        │
│  quantitative data  │──┤and├─│  qualitative data   │
└─────────────────────┘  └───┘ └─────────────────────┘
```

Use strategies to merge the two sets of results to provide a descriptive summary

to finally

Interpret the merged results for the cases studied
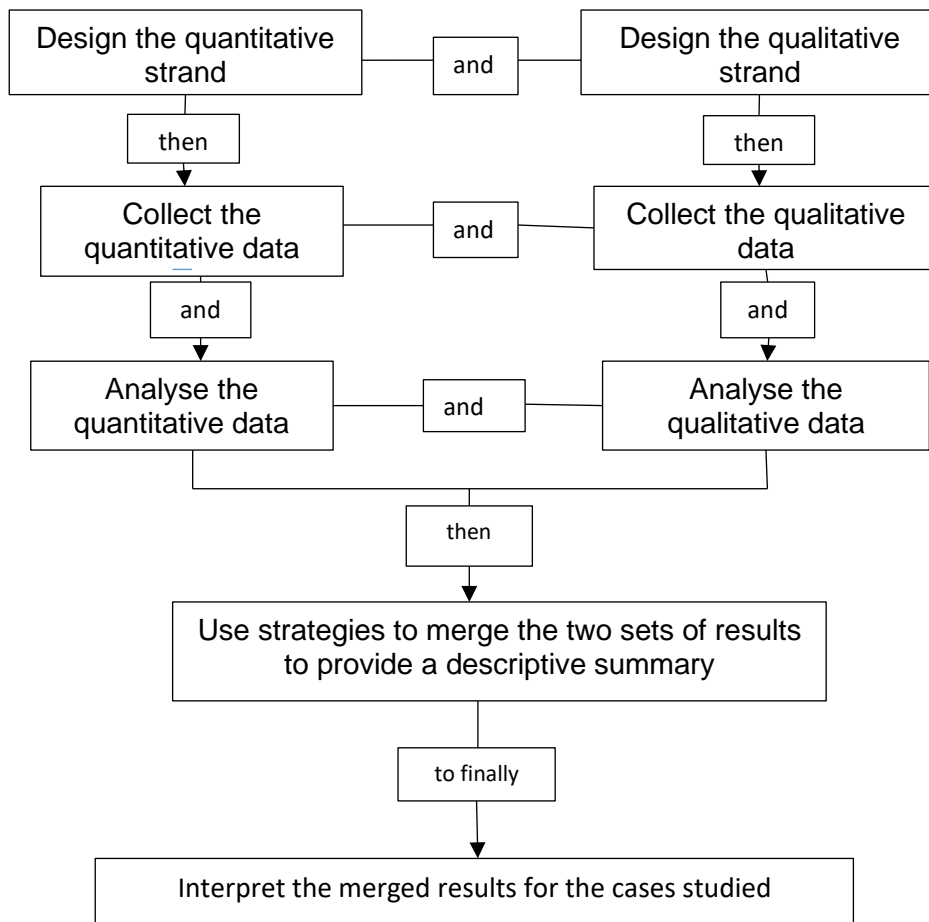
(Source: Adapted from Creswell & Clark, 2018)

Figure 4.2: The mixed methods case study design with a parallel convergent approach

4.3.2 Research Type

Data collection strategies and other aspects of methodologies, according to McMillan and Schumacher (2014), follow from the research questions. Since research is about discovering the unknown, there are many ways of arriving at truth. Therefore, it is important to come up with a plan that enables the researcher to answer the research question that in the first place should define an investigation, set boundaries, provide direction and act as a frame of reference for assessing progress in the research task (O'Leary, 2017). The research type chosen for this study and discussed in the next section is a methodological path that I considered appropriate to help answer the research question.

4.3.2.1 Case study research type

The research design for this study adopted a case study as the research type to carry out my empirical research to establish how the knowledge, skills and attitudes PSTs acquired in TTIs were applied in their curriculum practices. Yin (2018) points out that the term 'case study' is used differently by different researchers and authors. Some view it as a research strategy while others consider it to be a research method. Yin thus defines case study as a method in empirical research characterised by investigating a contemporary phenomenon referred to as the case. Such an investigation is detailed and within its real-world context where in some cases, the boundary insulation between the phenomenon and its context is thin. In this study, case study represents a research type that is part of a research design within the overall research methodology. This is similar to the view held by Cohen *et al.* (2018) who point out that any research in social science can be taken to be a 'case' adding that case study research uses multiple methods for data collection and data analysis.

Creswell and Creswell (2018) are more specific in their definition and refer to case study as qualitative designs in which the researcher explores in-depth phenomena and interacts with one or more individuals. They further clarify that the cases are bounded by time and activity and the researcher collects detailed information using a variety of data collection procedures over a sustained period of time. Such an in-depth investigation reflects the complexity and uniqueness of an empirical research exercise.

In this study where the contemporary phenomenon was ESE occurring in two TTIs and two schools, there are four cases with each case having its unique contextual conditions that require in-depth investigation to help establish the extent to which TTIs in Eswatini prepare PSTs for teaching and integrating ESE into their curriculum planning and teaching practices. I therefore relied on multiple sources of evidence to provide data that were converged using what Yin (2018) refers to as triangulation. The 211 respondents who completed the questionnaire, were drawn from institutions TA and TE that prepare PSTs for teaching and integrating ESE into their curriculum planning and teaching practices. As explained in Chapter One, each case served as a unit of analysis whereby as Yin (2018) observes, the protracted tracing for the prevalence of processes associated with ESE mediation allowed for data collection

and data analysis as complementary aspects of the study were combined to answer the research question.

Creswell and Clark (2018) point out that when the end goal of a mixed methods case study design is to generate data from multiple cases, the philosophical assumptions tend to lean towards constructivist perspectives. It should be pointed out that in this study, I used the term constructivism in the context of teaching and learning (see Figure 3.3, section 3.2.1) where, as a learning theory, the constructivist assumptions about learning were highlighted, emphasising that knowing is a process of actively interpreting and constructing individual knowledge representations (Driscoll, 2014).

The mixed methods case study design was not only multiple, but also what Cohen *et al.* (2018) refer to as an educative descriptive case study. As a convergent parallel or integrative design, both the qualitative and quantitative research approaches were apportioned equal priority 'QUAL + QUAN' (Leavy, 2017:174). Therefore, constructivism, in this study is not applied as a worldview but instead, the constructivist theory of learning informed both the qualitative and quantitative strands of research as indicated in Figure 3.5, where it is highlighted that teaching and integrating ESE into curriculum planning and teaching practices of PSTs in TTIs in Eswatini should be mediated in constructivist learning settings that are grounded in inter and transdisciplinary knowledge construction contexts (Driscoll, 2014).

Yin (2018) again points out that before work in the research study field can commence, what constitutes a case must be established and the number of sites to be studied should be carefully selected so that the research methods used are properly identified. In this study, all the research design decisions relating to the nature of the case study methodology are underpinned by the main aim of the empirical research that I undertook and the type of research questions that this study set out to answer (see Section 1.5.2). As part of a case study feature, I decided as pointed out by Yin (2018), on the type of research methods that I used to generate data to establish the way PSTs were being prepared for teaching and integrating ESE into their curriculum planning and teaching practices. These research methods are described in the next section.

4.4   RESEARCH METHODS

In this section, I describe the different methods of data collection that were used in this study. Research methods involve the procedures for data collection, data analysis and data interpretation used in empirical research and entail all the methods which are used by the researcher to perform research operations in an attempt to answer the main research question in a study (Cohen *et al.,* 2018; Creswell & Creswell, 2018; McMillan & Schumacher, 2014). Cohen *et al.* (2018) add that methods are a range of approaches used to gather data used by a researcher as a basis for inferring.

This study used methods consisting of administering a questionnaire, conducting face-to-face interviews, analysis of documents, lesson observations, field observations and observation of practices. In the Mixed Methods Instrumental Multisite Case Study design used in this study, I made sure that not only were the selected methods able to generate data to establish the extent to which PSTs in TTIs in Eswatini were being prepared for teaching and integrating ESE into their curriculum planning and teaching practices, but also that they aligned to ontological and epistemological philosophical dimensions of this study described in Section 4.2.1.

The selection of the methods allowed for the generation of both qualitative and quantitative data on the way PSTs are being prepared for teaching and integrating ESE into their curriculum planning and teaching practices, meaning that the two contexts where data were generated retained their naturalistic setting. However, it should be pointed out that whereas the qualitative data collection settings are characterised by free exchange of dialogue between the participants and the researcher allowing them to express their ideas relating to ESE integration in their curriculum planning and teaching practices, the quantitative settings are such that as a researcher, I was detached from the respondents while I administered the questionnaire to not only gauge PSTs' knowledge levels but also the prevalence of pro-environmental attitudes.

The methods of document analysis, interviews, observations and a survey meet the criteria just mentioned; in addition, they fulfil philosophical assumptions based on the pragmatist world views about the singular and multiple realities associated with preparing PSTs to teach and integrate ESE into their curriculum planning and teaching

practices. The procedures that were followed to select respondents and participants out of whom valuable data were generated are discussed in the next section.

4.4.1 Selection of Participants and Respondents

As indicated in Section 1.7.2.1, I not only used 211 PST as respondents to conduct a survey, but also 15 participants that took part in face-to-face interviews. The 211 respondents from institutions TA and TE were PSTs pursuing studies to obtain a teaching qualification. The PSTs at institution TA were pursuing a Primary Teacher's Diploma (PTD) while the ones at institution TE a Secondary Teacher's Diploma (STD).

Since the questionnaire and letters of consent stated that the survey answers would remain confidential, the anonymity provided an avenue for more honest and unambiguous responses making this source of data dependable (McMillan & Schumacher (2014). It is this representative group that reflected ESE knowledge levels and the extent of prevalence of pro-environmental attitudes among PSTs in Eswatini. The data collected using questionnaires enabled me to use specific observations to generalise by making inferences about the state of ESE knowledge and pro-environmental attitudes that in this study are considered necessary for effective teaching and integrating of ESE into PSTs' curriculum planning and teaching practices (Shuttleworth & Wilson, 2008).

In this study, I used cluster sampling that McMillan and Schumacher (2014) define as selection of naturally occurring groups of people identified from a larger population. I identified 211 PSTs from a geographically close cluster of two government-assisted TTIs.

The 15 participants that took part in the structured face-to-face in-depth interviews were selected through purposive sampling described by McMillan and Schumacher (2014) as a form of selection where a researcher selects particular elements from the population on account of desirable characteristics. I selected the 15 participants because I considered them to have rich information regarding how the knowledge, skills and attitudes PSTs acquired in TTIs, are being applied in their curriculum planning and teaching practices.

The 15 selected participants consisted of three heads of institutions, six lecturers and four PSTs from two TTIs already identified as institution TA and institution TE. In

addition, two officials, one from EEA and another from MESA, all professionals and civil servants that are still in active service in Eswatini participated. They were selected because they were expected to be knowledgeable and therefore informative in areas of policy and practice regarding ESE activities. The vice-chancellor of institution TA and the principal of institution TE supervise and guide academic staff at their respective TTIs in areas of policy and practice that include curriculum implementation. The dean of institution TA ensures that effective curriculum implementation takes place at the micro-level of curriculum implementation where PST professional preparation takes place. The dean is expected to be well-informed on the alignment of the FoE strategic plan and ESE integration in the faculty operational policies. The dean at institution TA as well as the principal at institution TE were also expected to be knowledgeable on how their respective TTIs planned to attain targets 4.7 and 4c of the 2030 UNGA.

The lecturers were selected from the learning areas of Science, Mathematics, Social Studies and Languages. Each institution provided one lecturer from a learning area. The six lecturers were included because they teach PSTs guided by the course outlines contained in curriculum documents that were part of the document analysis carried out as part of this study. Since the lecturers design the course outlines just mentioned, I considered them to be knowledgeable on matters of subject integration as part of their curriculum practice. From the 211 PST respondents that took part in the survey conducted to collect quantitative data, I purposively selected four students, two from each TTI, based on their ability to engage in meaningful two way communication, as recommended by their respective subject lecturers. These four students were required to answer the interview questions put to them and to give responses that would help to address the research questions. One official from EEA and another one from MESA were interviewed to provide information on policies guiding sustainability in relation to the realisation of targets 4.7 and 4c of the 2030 UNGA. The two officials were selected because they are part of national policy formulating organisations directly dealing with environmental and sustainability issues.

The 211 respondents as well as the 15 participants provided rich data to help establish the extent to which PSTs in TTIs in Eswatini were being prepared for teaching and integrating ESE into their curriculum planning and teaching practices. The way data were collected is discussed in the next section.

4.4.2 Data Collection

As earlier introduced in section 1.7.2.2 of Chapter One of this study, the data collection methods utilised measuring instruments and descriptive information collection methods characteristic of case studies. The data collected aimed to bring to light new knowledge through a systematic, formal and intensive process that requires a high level of precision in the endeavour to discover knowledge (Pandey, 2015). Altogether, the data collecting tools that I utilised in this study consisted of a survey structured questionnaire made up of closed-ended questions, interview schedules, teaching practice lesson observation schedules, physical grounds observation schedules and observation schedules of what is practised.

4.4.2.1 Quantitative data collection

For quantitative data collection, I developed and used a closed-ended questionnaire to collect data from 211 respondents. The leading section of the questionnaire used in this study labelled 'Section A' required the respondents to provide personal data without declaring individual identity. The second section labelled 'Section B' contained 30 statements that were used to elicit responses meant to gauge the extent to which PSTs were knowledgeable on ESE matters. The third section labelled 'Section C' comprised 30 statements aimed at establishing the extent to which PSTs had developed pro-environmental attitudes.

The hand delivered questionnaire for face-to-face administering had all instructions carefully written out as part of the brief introductory remarks. The statements in Sections B and C were, as recommended by Delport and Roestenburg (2014), brief and clear, each containing one thought to reflect concepts associated with ESE. The statements were worded to the level of English pitched at the reading level expected of PSTs at the two TTIs. Each statement was short consisting of about 15 words.

As a researcher, I presented a carefully edited questionnaire in a well-done user-friendly format (McMillan & Schumacher, 2014). In order for my questionnaire to have characteristics of a user-friendly research tool, the items in Section A that were used to elicit biographical information of a respondent were, as suggested by McMillan and Schumacher (2014), separately written on one line from top to bottom. Before administering the questionnaire to the 211 respondents, I subjected it to a pilot test.

The personal information items in Section A consisted of gender, age range, region of origin, home location and year of study. The items in all sections of the questionnaire were closed ended in that respondents chose from pre-determined responses. The closed-ended items were scaled without indicating the value of each response scale (McMillan & Schumacher, 2014).

In Section B, in order to gauge the level of knowledge on ESE issues among PSTs so that the knowledge levels could be quantified for each respondent, I used a True-False scale to qualify a response as right or wrong. By doing this, I was able to measure how much knowledge a respondent had on ESE matters. The responses were quantified by awarding a correct response one mark and a wrong response zero mark. As explained in detail in Chapter Five, all the questionnaires were marked to determine each respondent's score out of the 30 possible responses. A respondent who scored 50% or more was considered to be knowledgeable in matters of ESE, whereas the one who scored less than 50% was considered to lack adequate knowledge on ESE matters.

In Section C, I sought to establish the prevalence of pro-environmental attitudes by using a five-point Likert scale to quantify levels of attitudes. The 'agree-disagree' scale progressed from 'strongly agree' to 'agree' followed by the 'neutral' option where the respondent 'neither agree nor disagree'. This was then followed by 'disagree' and at the end of the progression was the 'strongly disagree' response. The scale was quantified by awarding positive two (+2) points for 'strongly agree', positive one (+1) point for 'agree', zero (0) point for 'neither agrees nor disagrees', negative one (-1) point for 'disagree' and negative two (-2) points for 'strongly disagree'. The statements were designed in such a way that a response that strongly agrees or strongly disagrees with the statement either had the highest score of +2 or the lowest score of -2 depending on the way the statement had been framed.

Worth noting is the fact that in the design for Section C statements, I apportioned the rest of the values between +2 and -2 by referring to the information that I found in the literature study presented in Chapter Two. With that information, I pre-determined the extent to which a statement deviated from what is considered to be a pro-environmental attitude. By adding up the total scores on pro-environmental attitudes, I was able to determine the level of prevalence of pro-environmental attitudes by

considering individual scores that ranged between +60 and -60. The neutral choice carrying a zero value represents respondents with a neutral attitude towards environmental issues. A respondent whose total score was a positive value, was considered to have pro-environmental attitudes while the one whose total score was negative was considered to lack pro-environmental attitudes. High positive attitude values ranged between 30 and 60; that is, those with a score of 50% and above. Negative, neutral or low positive attitude values ranged between 29 and negative 60; that is, with a score below 50%.

By successfully using the questionnaire that I developed for this study, I was able to obtain data to help me not only determine how much ESE related knowledge was present among PSTs sampled for this study, but also to establish the extent to which pro-environmental attitudes existed among them.

4.4.2.2 Qualitative data collection

In this study, qualitative data were collected through the process of curriculum document analysis, in-depth interviews, lesson observations, field observations and observations in practice.

(i) Curriculum document analysis

The term document analysis, sometimes referred to as content analysis, refers to a process of collecting, reviewing and analysing printed texts that a researcher uses as a source of empirical research data meaning that all such documents contain recorded information preceding all data that is later generated in a research study (O'Leary, 2004, 2017). O'Leary (2017) adds that document analysis is in part carried out to identify meanings that are embedded in the content being analysed. Cohen *et al.* (2018) define document analysis as the process of summarising and reporting the main contents of data and their messages which may be written either in print format or digitally. Babbie (2016) refers to document analysis as the study of recorded human communications that can be found in print as well as electronic formats. He identifies books, web pages, e-mail messages and many forms of internet postings as forms that are suitable for study.

Lune and Berg (2017) describe document analysis as a careful, detailed, systematic examination and interpretation of a particular body of material in an effort to identify

patterns, themes, assumptions and meanings in written documents, photographs and audio-visual resources. O'Leary and Hunt (2017) further explain that all recorded data that exists independent of a research project is referred to as secondary data and such data can be found in documents, databases and on the internet, making it enormous but readily accessible. Primary data, according to O'Leary (2017), is data that is made available through the process of research as determined by a researcher attempting to answer a research question.

The above definitions and explanations about document analysis and recorded data guided me when I analysed curriculum documents in three curriculum fields that Bernstein (1990) categorised as the: Official Recontextualizing Field (ORF); Pedagogic Recontextualizing Field (PRF) and the Reproduction Field (RF). I took what Babbie (2016) calls a holistic interpretivist approach to the analysis of texts to design analytical tools (see Tables 5.28 and 5.34) that were used to analyse texts to help me understand the extent to which ESE was integrated into these curriculum texts as they were used to prepare PSTs in Eswatini for teaching and integrating ESE into their curriculum planning and teaching practices. The texts represent multiple realities whose meaning can be determined through the analysis of the given content to help find the underlying meaning that was originally communicated (Babbie, 2016). Ahuvia (2001), however, argues that instead of viewing document analysis as a method for quantifying the content of texts, we should approach it from the aspect of identifying interpretations of content. He further explains that interpretive content analysis principally focuses on latent content analysis that he describes as a process that 'ferrets out a text's subtler meanings' (Ahuvia, 2001:141). Ahuvia (2001) is effectively calling for a more pragmatic approach to document analysis, to blend traditional content analytic sequencing with infusions that are interpretivist.

Heeding Ahuvia's (2001) call, I collected data from up-to-date course outlines used by lecturers in the two TTIs that participated in this study, aware that course outlines are a form of pedagogical recontextualising field curriculum texts. These course outlines as pedagogic documents, guide the teaching and learning practices of PSTs and analysing them revealed valuable data to inform this study on the extent to which PCK was linked to ESE as PSTs in Eswatini were prepared for teaching and integrating ESE into their curriculum planning and teaching practices.

Because document analysis relies on data existing in a permanent form referred to as texts, verification through re-analysis and replication is possible. Text represents a form of social reality that is best understood by analysing its latent content (Ahuvia, 2001). O'Leary and Hunt (2017) further explain that conducting document analysis to obtain data provides a valuable separation between the researcher and what is being researched. They add that with existing data, not only is the possibility of tainting data with bias removed, but also that the demands for interpersonal aspects such as building trust and getting people to act naturally are eliminated.

The interpretive content analysis to curriculum documents in the ORF, PRF and the RF (Bernstein, 1990) to get qualitative data that were analysed with analytical tools earlier mentioned was guided by the suggested set of analytic activities pointed out by Lune and Berg (2017), meaning that I analysed content and turned it into text for further studying.

The limitations of document analysis are highlighted by Cohen *et al.* (2018) who note that existing documents that were not originally written for research purposes may be biased, incomplete and in some cases inaccurate. Therefore, I carefully applied a qualitative approach to document analysis to focus on interpreting the elements in the texts. I was in part guided by Ahuvia's (2001) contention that latent document analysis should focus on interpretations that carry deeper meanings to make the most compelling and contextually sensitive interpretation. The key benefit of collecting data by document analysis is that compared to surveys, interviews and observations, it saves time, energy and money in situations when the content relevant to the research task is readily available especially in accessible digital format. It should be pointed out that accessing documents to analyse content relevant to a study can turn out to be a very expensive undertaking depending on the conditions under which the researcher is conducting a study. Overall, existing data should be carefully screened for credibility and authenticity so that only accurate and credible information is used, whether from printed text books or as an online resource (O'Leary & Hunt, 2017).

(ii) Lesson observation

Lesson observation was the third method used to collect qualitative data. Data were generated by observing four lessons taught by PSTs during their teaching practice exercise. According to Creswell and Creswell (2018), in a qualitative observation the researcher takes field notes on the behaviour and activities of individuals at the research site. Observation as a research process makes available the opportunity to collect first-hand data from naturally occurring social situations (Cohen *et al.,* 2018). Leavy (2017) then explains that the methods of research data collection in this category are either participatory or non-participatory modes of observation. Whereas participatory observation requires the researcher to engage in the activities being researched, non-participatory observation involves observing participants without engaging in the same research activities.

Observation, considered by Lune and Berg (2017) as an intruding research process is nevertheless highlighted by O'Leary (2017) as a useful means of gathering quality data since it takes place in the real world as opposed to a constructed research setting. O'Leary (2017) defines observation as a systematic method of data collection that relies on a researcher's ability to gather data through his or her five senses. She adds that the options for observation range from studies that are highly removed and structured to those that are highly involved, and in some cases, messy. She warns that the history, interests, experiences and expectations of a researcher can easily affect the quality of data collected during observation. O'Leary (2017) is reminding us that the researcher is a subject who gets immersed in research work with personal experiences that include personal judgements and beliefs to the effect that such a researcher is likely to be influenced by existing personal opinions.

In this study, I applied what O'Leary (2017) calls the structured candid non-participant observation where the observed was always aware that I was present to observe. This method of research enriched my data because it was conducted in a natural learning construction site; that is, a classroom. The exercise yielded valuable data that helped to explain the extent to which PSTs were being prepared to integrate ESE knowledge, skills and attitudes into the Eswatini school curriculum. The observation schedule that I used in the structured approach in this study was informed by the extensive literature study recorded in Chapter Two of this study. That literature provided the guidelines to

draft the contents of the observation schedules which I used during lesson observations. Samples of observation schedules used in this study are presented as Appendices G, H and I.

(iii) Interviews

I used interviews to generate text data from curriculum practices of 15 carefully selected participants known to be directly or indirectly involved in preparing PSTs for teaching and integrating ESE into their curriculum planning and teaching practices. Lune and Berg (2017) explain that interviewing is a form of a conversation aimed at gathering information where, as put by O'Leary (2017), asking and listening are both crucial aspects of the interview process as a researcher seeks open-ended answers related to a number of carefully selected questions. As a tool for data collection, interviews rely on verbal, non-verbal, seen, spoken, heard and written sensory channels and as such, data collected through interviews is in the form of words that are shaped by the perspectives of the participants and conventional discourse practices at any given time (Lune & Berg, 2017).

Cohen *et al.* (2018) point out that interviews enable the interviewer and interviewee to discuss interpretations of realities in their contexts as they express how they regard situations from their own point of view. Such human interaction situates the text data generated in a social context. According to Lune and Berg (2017), there are three forms of interview structures. The formal or highly structured standardised form, the unstandardised, informal or non-directive interview and the semi-standardised semi-structured focused interview. The major difference among these different interview structures is their degree of flexibility with regard to interview operationalisation. In this study, I used the semi-structured focused interview (Appendix F).

Regarding the quality of interview schedules, Lune and Berg (2017) advise that the researcher should avoid using affectively worded questions because they more often than not arouse a negative emotional response. They also point out that interviewers should avoid double-barred questions that ask participants to respond simultaneously to two issues in a single question. Again, they advise that questions should be kept brief and concise to allow for clear responses that in the end, make it easier to analyse the answers. O'Leary (2017) cautions that conducting a good interview requires one to plan for all eventualities, prepare an interview schedule and a data-recording

system, run a trial and modify the schedule to make it appropriate before finally conducting the interviews in order to analyse the data collected.

Therefore, in order to ensure that my interview schedules would have appropriate wording and sequencing of questions, I pretested all of them by firstly giving the schedules to a carefully selected member of the academic staff at institution TA to identify poorly worded questions, questions with unacceptable wording and questions that could reveal my personal biases. Secondly, before using the interview schedules, I conducted one practice interview for each of the six interview schedules in order to assess the effectiveness of the interviewing process to yield valuable data. The practice interviews were recorded and later used to identify parts of questions that required modifications. I also adjusted questions that had a different meaning from that which I intended.

Lune and Berg (2017) warn that research interviews are not a natural communication exchange and caution that an interviewer should try to minimise or eliminate a participant's evasion tactics during the interviewing process. The interviewer should do his or her best to create and sustain rapport in order to minimise generating misinformation and lies. As advised by O'Leary (2017), during the interview process, I did more listening than talking as a way of facilitating the interviewees' ability to respond to questions. To that effect, I asked questions that facilitated the answering process to ensure that I was in charge of the process from beginning to end. For each of the 15 participants that took part in this study, I made sure that I cross-checked appointments, arrived on time to set up and check my recording equipment and above all, to do my best to establish rapport. I also explained ethical issues after introducing the study to emphasise that not only is confidentiality guaranteed but also that the participant is advised on his or her right to decline to answer any question/s and also the right to end the interview upon request.

In the end, the interviews enabled free expression as each of the 15 participants were accorded the opportunity to describe their feelings and experiences related to teaching and integrating ESE into curriculum planning and teaching practices. The partial flexibility of the semi-structured type of interviews that I chose for this study allowed me to adjust my questions as the interview process progressed for each participant. For each of the interviews that were carried out, adjustments were guided by emerging

contexts of the interview process. With carefully selected questions that I pre-determined, guided by the literature study (see Chapter Two) of this study, I probed responses from the interviewees which enriched the data that were collected. In order to keep an accurate record of the interviewing process, I audio recorded the interviews using a digital recording device. A sample of an interview schedule is found in Appendix F.

4.4.2.3   Field observation

In Section 4.4.2.2, I explained the mode of observation that was applied during lesson observation for both lecturers and PSTs where I stated that I intruded on whatever could be observed. In contrast, Babbie (2016) describes unobtrusive non-reactive research methods as those that involve studying social behaviour without affecting it. In this study, not only did I use document analysis as an unobtrusive research method, but also applied field observation and observations in practice to obtain data to help with establishing how the physical infrastructure and the natural surroundings combined with human practices enhanced or hindered the integration of ESE into curriculum practices that prepared PSTs for teaching and integrating ESE into their curriculum planning and teaching practices. In this form of research approach, the main resources for observation and analysis are established records in the form of infrastructure and events relating to sustainability and the environment that occur within the time frame the research task is carried out. As a researcher practising unobtrusive non-reactive research like a detective investigating a crime, I looked for clues of social behaviour that represented answers to important questions existing in observable lived experiences relating to sustainability and the environment (Babbie, 2016).

O'Leary (2017) notes that as human beings, our understandings are narrowed by what we can manage to take in through our sensory organs that send sensory input into our cognitive processes responsible for constructing condensed information that we recognise and use as observations. Unlike the casual observations that we make in our daily lives, observing as a social science method requires planning in order to collect credible, valid and authentic data.

To that effect, the field observation for this study took the form of a candid, non-participant structure, one occasion observation lasting about one hour at each secured

research site. I collected data using an observation schedule and later analysed the collected data using a tool that was based on the Theory of Curriculum Implementation put forth by Rogan and Grayson (2003).

The field observation was not only carried out in two TTIs where PSTs are prepared for teaching and integrating ESE into their curriculum planning and teaching practices, but also in two schools where PSTs that were interviewed, were conducting their teaching practice exercise. I used one of Rogan and Grayson's (2003) three constructs necessary for effective curriculum implementation – the Capacity to Support Innovation and Outside Support – to design a field observation schedule that dealt with physical resources. The field observations simultaneously involved observing practices discussed in the next section.

4.4.2.4 Observations in practice

PSTs and lecturers participate in different ESE contexts in and outside the classroom. As part of unobtrusive non-reactive observations carried out in this study, I observed practices outside the classroom to record actions and activities that should help to identify gaps between what is said and what is done (O'Leary & Gewessler, 2014). Michael, Olalekan, Onjefu and Ovie (2017) emphasise that such a type of observation requires planning, watching, recording and analysing of observed behaviour found in natural settings.

On different occasions for each of the four cases, I conducted spontaneous non-participant direct observations to gather data whenever possible. All data were recorded to help determine the extent to which pro-environmental behaviour patterns and sustainability lifestyles were present in real life practices linked to preparing PSTs for teaching and integrating ESE into curriculum planning and teaching practices. According to O'Leary and Gewessler (2014), professional capabilities need to be assessed and evaluated beyond lesson observations because such evaluations are a method of inquiry that contributes to dialogue when supported by peer coaching, self-reflection and experiential learning. For each case where I conducted observations in practice, I recorded observations at different times in different places in form of written field notes, digital photographs and audio-visual recordings that did not include human beings.

Lontz (2016) encourages observing without predicting and inferring and to watch and record what is noticed spontaneously referring to such scientific observations as being objective and requiring focus and attention to exclude feelings and judgements that are characteristically emotional. While collecting data of observations in practice, I also recorded my personal feelings, a form of self-observation, using a journal to help me with self-analysis that according to Lontz (2016), leads to a better handling of research undertakings. This, she suggests, comes about as the researcher questions his actions and, in the process, makes useful adjustments to ensure that the research output is credible.

4.4.2.5 Pilot studies

Pilot studies, also known as feasibility studies, not only refer to mini versions of a full-scale study but also the pre-testing of research instruments that include questionnaires, interview schedules, observation schedules and analytical tools. Such studies help to give advance warning about where aspects of the research design may prove to be inappropriate in key areas such as research protocols, research methods and research tools. Pilot studies can also help to uncover grass-roots administrative entanglements a researcher may not be aware of (Van Teijlingen & Hundley, 2002). Pilot studies further help to expose extraneous variables that usually emerge in the form of unanticipated issues enabling a researcher to redesign parts of a study in an attempt to minimise and eliminate such variables. In the end, pilot studies help to select measures that produce the clearest results to guide answering the main research question (Woken, s.a.)

In this study, I conducted a series of pilot studies to assess the effectiveness of research instrumentation that I used to collect and analyse data. The series of pilot studies guided me in the preliminary testing of hypotheses and also provided me with ideas, approaches and clues that I may not have foreseen while I put together the research design. Gudmundsdottir and Brock-Utne (2010) point out that a proper analysis of the procedures and results from the pilot study facilitates the identification of weaknesses whose addressing leads to improved quality of research outcomes as pilot study results are used to inform subsequent parts of the research process. In this study, I used both the feasibility study and the pre-testing of the questionnaire and analytical tools. The feasibility study was used to assess what Gudmundsdottir and

Brock-Utne (2010) pointed out as the practicalities of the main study in terms of implementation and utilisation. In that regard, I assessed aspects of the time taken to collect data using a questionnaire and interview schedules.

The pretesting of the questionnaire was carried out in two phases. Firstly, I requested a carefully selected individual to carry out a self-administered pre-test on the questionnaire that I designed. The final version that was approved was then used in the second phase of pilot testing where I administered the piloted version of the questionnaire to 30 PSTs not taking part in this study. As part of the pilot study with the questionnaire, the wording and order of the questions and range of answers were scrutinised. In addition, the research process on how the questionnaire was to be administered, that is, how it would be distributed and collected, were checked. Pilot study tests were also carried out on all interview and observation schedules to ensure that procedural strategies incorporated in their designs could adequately generate data to determine the extent to which PSTs were prepared for teaching and integrating ESE into their curriculum planning and teaching practices.

Pilot testing of interview schedules were only carried out for the interview schedule of PSTs using one person. In all my handling of the pilot studies, I was aware of the possibility of making inaccurate predictions or assumptions on the basis of pilot data (Van Teijlingen & Hundley, 2019). The full report of the outcome of the pilot studies that were conducted and the actual improvements that were made to different aspects of the study design and the whole research process for this study, are provided in Chapter Five of this dissertation.

4.4.3 Data Analysis

The assessment, evaluation and interpretation of the collected quantitative and qualitative data were done separately. Analysis, according to Trent and Cho (2014), involves summarising and organising data. In this study that utilised the single-phase approach of convergent mixed methods design (Creswell & Creswell, 2018), I simultaneously collected and analysed qualitative and quantitative data and then I compared the results to see if the findings confirmed or disconfirmed each other. Creswell and Creswell (2018) point out that data analysis in a convergent design consists of three phases. Firstly, qualitative data is analysed by coding it and collapsing the codes into broad themes. Secondly, quantitative data is analysed using

inferential data analysis techniques. Thirdly, the two sets of data derived from the research exercise are integrated. They warn that merging a numeric database with a text database requires careful cognitive processing. O'Leary (2017) also cautions that even though computer programmes are available to facilitate data analysis, the researcher must work strategically, creatively and intuitively to arrive at both expected and unexpected research findings.

In this study I applied the side-by-side comparison approach suggested by Creswell and Creswell (2018) in that I first processed the quantitative statistical results before dealing with qualitative findings involving themes and text data. In the next section, I explain how quantitative data were analysed to address the research question, a process that involved hypothesis testing.

4.3.3.1 Quantitative data analysis

Babbie (2016) defines quantitative data analysis as the numerical representation and manipulation of observations for the purpose of describing and explaining the phenomenon that those observations reflect. In order for this to serve the purpose of empirical research, coding of non-numerical responses in the collected data is required, as numerical representations are assigned to variables in a research tool such as a questionnaire.

Cohen *et al.* (2018) add that quantitative data analysis is a powerful research form whose use is entirely dependent on fitness for purpose. In this study numerical data analysis was performed using the Statistical Package known as IBM SPSS Statistics version 28.0 that as a software package, applied statistical formulae and carried out computations on raw data collected from the research field (SPSS Statistics, 2021).

(i) Data analysis using descriptive statistics

In this study, responses from 211 questionnaires were analysed using percentages to indicate the levels of ESE knowledge observed in each of the two TTIs. The same 211 questionnaires were used to determine percentages of the variables of gender, age range, region of origin, location of residence and year of study in the two TTIs. Additionally, the prevalence of pro-environmental attitudes was indicated using percentages for the combined data for the same variables of gender, age range, region of origin, location of residence and year of study.

(ii) Inferential test of relationships

The second analysis of quantitative data collected from 211 respondents was carried out using inferential data analysis – the Chi-square non-parametric test. In the first part of inferential data analysis, I used the Chi-square test of independence to establish if a relationship between pairs of selected variables and ESE knowledge levels among PSTs existed. Using data from the two TTIs, the Chi-square test was applied to determine how the variables: gender – male or female; region of origin – Hhohho, Manzini, Shiselweni and Lubombo; location of residence – rural or urban; year of study – continuing or final year three student and age range – 25 years of age or younger and above 25 years of age related to and therefore influenced ESE knowledge levels in the sample of 211 respondents.

With the same data from the two TTIs, I again used the Chi-square test to determine how the variables: gender – male or female; region of origin – Hhohho, Manzini, Shiselweni and Lubombo; location of residence – rural or urban; year of study – continuing or final year three student; and age range – 25 years of age or younger and above 25 years of age related to and therefore influenced the prevalence of pro-environmental attitudes. The inferential test of relationships was computed for analysis using the Statistical Package; IBM SPSS Statistics, version 28.0 (SPSS Statistics, 2021). For each pair of selected variables, the Inferential Test of Relationships was guided by the null hypothesis that 'there is no relationship between the selected variable and ESE knowledge levels' meaning that a selected variable such as gender did not affect ESE knowledge levels of PSTs. What this actually means in the social context is that ESE knowledge levels among PSTs do not depend on whether they are female or male.

I chose to use the Chi-square test because the questionnaire designed for this study recorded independent countable observations (Grande, 2014; Marin, 2018). In that questionnaire, the first observations were made on the level of ESE knowledge among PSTs in the two TTIs and were recorded as Section B entries of the questionnaire. The second observations recorded as Section C entries dealt with the prevalence of pro-environmental attitudes among PSTs in the two TTIs. In preparing the questionnaire for this study, I ensured, as pointed out by Grande (2014) and Marin (2018), that the following assumptions for Chi-square test were not violated:

- Ensuring the independence of observations presented in the form of recorded responses that in this study were separate statements answered by respondents.
- Using a large sample size that in this study was 211 respondents
- Having data expressed in frequencies that in this study are numbers of PSTs

As required in doing such research, before embarking on analysing quantitative data for this study, I did some research to understand how the Chi-square test serves as an analytical tool to enable me to correctly interpret the results computed with the IBM SPSS Statistics computer programme (Grande, 2014; Marin, 2018; SPSS Statistics, 2021).

Because statistics relies on the reduction of meaning to numbers (O'Leary, 2017), the intricate and complex multiple realities linked to preparing PSTs to teach and integrate ESE into their curriculum planning and teaching practices also required qualitative data analysis, which is discussed in the next section.

4.3.3.2 Qualitative data analysis

According to Babbie (2016), qualitative data analysis (QDA) is the non-numerical assessment of observations made through direct and indirect observation, group discussions, content analysis, and interviews among other qualitative research methods. QDA is guided by its own logic and techniques that in some cases are enhanced by special computer programmes, approaches that help to create new understandings by exploring and interpreting complex data gathering using qualitative methods mentioned at the beginning of this paragraph. This form of analysis is a process where the researcher attempts to understand and interpret people and situations under investigation (Leavy, 2017).

In QDA, the summarising and organising of data and making meaning from that data respectively constitute data analysis and data interpretation that more often than not take place as a recurring process (Leavy, 2017; Trent & Cho, 2014). QDA relies on multiple interpretations of situations implying that a researcher should focus on multiple perspectives of a phenomenon so that he or she is able to interpret them holistically (Cohen *et al.,* 2018).

(i)   Analysing data from document analysis and lesson observations

The analysis of data from curriculum documents in the ORF, PRF and the RF as well as data obtained through lesson observations at the TTIs and schools was guided by the Bernsteinian-based research tools (Bernstein, 1990) that I adapted from one originally designed by Nsubuga (2011). The designing of the research tools that I used as analytical frameworks is based on Bernstein's concepts of Classification and Framing; these tools make it possible for researchers to systematically describe pedagogical discourse. In the classroom, an official pedagogic discourse is transformed as it is utilised during the process when it is changed into instructional knowledge during the teaching and learning experience. This is the process that Bernstein (1990) refers to as recontextualisation of knowledge. Classification and Framing, as indices of knowledge recontextualisation, reveal relations between discourses of knowledge and practice. Framing was used to analyse the form of lesson episodes and Classification to analyse the contents of the lesson episodes. Section 3.2.2 of this study gives details of Bernstein's concepts of Classification, Framing and Recontextualisation.

Nsubuga (2011) designed a tool to analyse and monitor the extent to which environmental issues were integrated into teacher's lessons. Her analytical tool consisted of what she judged to be key features that represented integration, features that she called key criteria. In this study, analysing data from curriculum texts and lessons taught involved selecting criteria that were representative of the purpose and content not only of lessons taught but also of curriculum documents in the ORF, PRF and RF. I also selected for each criterion, key indicators of teaching and integrating ESE into curriculum planning and teaching practices. The term indicator in this study refers to a piece of descriptive information in a given criterion that describes the status of curriculum texts and lessons taught to prepare PSTs for teaching and integrating ESE into their curriculum planning and teaching practices. The procedure that I adapted from Nsubuga (2011) to design my analytical tool, consisted of the following four steps.

1. Identification of key criteria in the content of curriculum documents and lessons observed

2. Selection of key indicators – for each criterion – of teaching and integrating ESE into curriculum planning and teaching practices
3. Construction of scaling grids using selected indicators based on Bernstein's scales of Classification and Framing
4. Generation of data by grading the performance of each indicator using the scaling grids

I obtained information from the literature that I studied and documented as Chapter Two to guide me in identifying each criterion. As for indicators, I relied on the work of Tilbury, Janousek and Bacha (2007) who classified indicators as being facilitative indicators or effect indicators or status indicators. In designing the indicators to correspond with identified criteria, I considered my indicators as the type that provided information on the status of preparing PSTs for teaching and integrating ESE into their curriculum planning and teaching practices; that is, my indicators are status indicators. For some of the criteria in this study, I also incorporated facilitative indicators to guide in assessing the variables that enhance and/or hinder the integration of ESE during PST training.

The construction of the classification scaling grids based on Bernstein's four-point scale was partly guided by information obtained from the literature study found in Chapter Two of this study. I put together scaling grids in order to grade the performance of indicators for the extent of integrating ESE not only into curriculum texts, but also into curriculum planning and teaching practices both of which contribute to preparing PSTs for teaching and integrating ESE into their curriculum planning and teaching practices (Bernstein, 1990). The aforementioned Bernsteinian four-point scale has representative letters C++, C+, C- and C- - qualified as follows:

- C++ represents very high insulation equivalent to very strong classification
- C+ represents high insulations equivalent to strong classification
- C- represents weak insulation equivalent to weak classification
- C- - represents very weak insulation equivalent to very weak classification

Because Bernstein (1990) considers insulation as that which counters integration, the representative letters C++, C+, C- and C- - can also be qualified in the following way:

- C++ represents very low integration

- C+ represents low integration
- C- represents high integration
- C- - represents very high integration

In order to ensure that the scaling grids were trustworthy (see Section 1.8), I relied not only on the literature study aspects that highlighted ESE dimensions to fit in my conceptual framework, but also on the professional knowledge that I acquired as I personally engaged in teaching and learning experiences linked to ESE. The scoring system reflected on the scaling grids was not uniform because different indicators analysed different criteria. Based on my professional knowledge, I determined the variations in the scoring system by setting different targets of performance for each indicator. The criteria that I used determined the scope of what was necessary to help answer the research question of this study (Nsubuga, 2011).

In order for the analytical tools to effectively serve their designated purpose, I generated data using schedules for lesson observation and document analysis and then analysed them by grading the performance of selected criteria using scaling grids that I designed. The construction of the Framing scaling grids based on Bernstein's four-point scale was partly guided by information obtained from the literature reviews, documented in Chapter Two of this study. I put together scaling grids in order to grade the performance of indicators to enable me to analyse the relationship between teachers and learners by determining the relative degree of control in learning spaces controlled by PSTs. The framing of categories is distinct and ranges from very weak framing to very strong framing. The Bernsteinian based four-point scale has representative letters F++, F+, F- and F- - qualified as follows:

- F++ represents very strong Framing
- F+ represents strong Framing
- F- represents weak Framing
- F- - represents very weak Framing

With the just aforementioned scale, I was able to construct an analytical tool to analyse the extent to which teacher and learner have control over the selection, sequencing and pacing of instructional knowledge The designing of the tool to analyse data to determine the level of framing of instructional knowledge followed the same procedure that I used to analyse data in order to determine the extent of integration using

Bernstein's concept of Classification. The same four steps given earlier in this section were followed. The data generated using lesson observation schedules were analysed by grading the performance of selected criteria using the designed scaling grids.

4.5 MEASURES OF TRUSTWORTHINESS

In empirical research, measures of trustworthiness are put in place to guarantee quality or rigour. As explained in Section 1.8 of this study, trustworthiness is the integrity and application of the methods chosen and the precision in which the findings reflect the data collected. In Section 1.8, aspects of trustworthiness were discussed in both qualitative and quantitative research approaches. They included credibility, transferability, dependability and confirmability. The rigour of research undertaken using quantitative research methods is achieved through the measurement of validity and reliability (Creswell & Creswell, 2018; Cohen *et al.,* 2018; Delport & Roestenburg, 2014; Korstjens & Moser, 2018).

In MMR, validity involves employing strategies that address potential issues in data collection, data analysis and data interpretations capable of compromising the meaningful merging of qualitative and quantitative strands of a study. The integration aspects of using MMR have compelled scholars to add MMR validity as a strategy for ensuring trustworthiness in this type of research. Some of the principles of validity needed to guide mixed methods approaches have to address the specific types of validity checks associated with both qualitative and quantitative research approaches (Creswell & Clark, 2018).

The word 'validity' as presented by authors such as Creswell and Clark (2018) and Cohen *et al.* (2018) among others, appears to dominate discourse on trustworthiness. Whereas Creswell and Clark (2018) highlight validity in MMR as employing strategies that address potential threats to drawing correct inferences and accurate assessments from integrated data, Cohen *et al.* (2018) insist that if a piece of research is invalid, then such research work is worthless. They add that a piece of research is only valid if the grounds that underpin it are defensible, where conclusions that are drawn and explanations that are given can stand their ground when confronted with rival conclusions and explanations. They further note that reliability is a necessary precondition of validity and emphasise that the terms validity and reliability have different meanings in qualitative research, quantitative research and MMR. Providing

accurate and verifiable research accounts is the responsibility of the researcher for, as O'Leary (2017) points out, they then consciously minimise the possibility of producing results that are false or misleading and altogether labelled by Cohen *et al.* (2018) as having no real value or use.

Leavy (2017) designates validity and reliability as the two main criteria for evaluating quantitative research. She points out that in qualitative practice, validity speaks to the credibility and trustworthiness of the research project undertaken emphasising that regardless of the term applied, validity or trustworthiness focuses on the rigour of the methodology and whether or not those who make use of research findings can have confidence in them and trust the generated data altogether.

O'Leary (2017) highlights validity and reliability as fundamental indicators of good research emphasising that when we have validity, we know that we are measuring what we intended to measure and when we have reliability, we know that results will be consistent under repeated trials. Whereas validity touches on the credibility of a description, conclusion, explanation or interpretation, reliability refers to consistency in methods, that is, the extent to which a measure, procedure or instrument provides the same results on repeated trials (O'Leary, 2017; Maxwell, 2013). In this study, the MMR assumptions have influenced the way I applied the terms validity and reliability in relation to ensuring the quality of my research work, preferring the construct trustworthiness promoted by Guba and Lincoln (1994), who pointed out that the trustworthiness criteria of credibility parallels internal validity, transferability parallels external validity, dependability parallels reliability and confirmability parallels objectivity.

Johnson and Onwuegbuzie (2004:52) suggest that in MMR, the term 'validity' should be replaced by 'legitimation' which refers to ensuring that the results got from empirical research are dependable, credible, transferable, plausible, confirmable and trustworthy. This view is challenged by Creswell and Clark (2018), who recommend that validity should not be approached generically but should instead be viewed and addressed in reference to the specific type of mixed methods design that is used in any given research task.

Creswell and Creswell (2018) further add that potential threats to validity exist when convergent approaches such as the one I applied in this study, are used. For example,

unequal sample sizes for both qualitative and quantitative samples may not provide the same perspective of the phenomenon being investigated. I took this into consideration when I converged quantitative data from 211 respondents and qualitative data from multiple sources.

Maxwell (2013) explains that validity in qualitative design helps one to decide whether or not conclusions are valid. He explains that a number of scholars associated validity with quantitative assumptions that were considered inappropriate for qualitative research. It is such researchers that proposed other concepts such as trustworthiness that were seen as being more appropriate for qualitative research. Emphasising an integrative approach, Maxwell (2013) then defines validity as the correctness or credibility of a description, conclusion, explanation and interpretation in the context of securing credible accounts at the end of a research task.

In this study, validity threats could have emerged from the respondents and participants surveyed and interviewed respectively if they chose not to present their actual views. Therefore, as a researcher, I carefully guarded against ignoring data that did not fit my interpretation. For the quantitative component of my research, validity threats were controlled in advance by looking out for and controlling any extraneous variables, applying randomised sampling, framing explicit hypotheses before collecting quantitative data and using tests of statistical significance. Qualitative researchers on the contrary deal with validity threats as particular events or processes that have the potential to lead to invalid conclusions, that is, research bias and research reactivity are two threats to validity often encountered in relation to qualitative studies (Maxwell, 2013).

Research bias involves the subjectivity of the researcher in selecting data to fit his or her existing theory, goals or preconceptions including selecting data that for whatever reasons is attractive to the researcher. Research reactivity refers to the influence the researcher has on the settings or individuals studied. As a non-participant observer, reactivity was not a big threat in this study. During interviews, I was part of the context in which data were sought. In such settings, data extraction is always influenced by the interviewer, interviewee and the whole interview process. Therefore, in this study, I endeavoured to cognitively internalise how I should influence whatever the participants were saying when I conducted interviews to obtain data that were detailed

and varied enough to provide a full and revealing picture of the extent to which TTIs in Eswatini prepared PSTs for teaching and integrating ESE into their curriculum planning and teaching practices.

To that effect, I was careful not just when creating transcripts of the interviews, but also when recording data from lesson observations, field observations and observations of practice. I relied on detailed, descriptive note taking in addition to audio-visual recording and transcribing of the specific, concrete events that were observed. I conducted and transcribed 15 interviews where each participant responded to open-ended questions of the interview schedules that were designed for this study. The data emerging from the in-depth interviews provided a rich detailed grounding for and test of my conclusions.

Authors such as McMillan and Schumacher (2014), O'Leary (2017), Creswell and Creswell (2018) and Cohen *et al.* (2018), among others, avoid assigning the terms validity and reliability exclusively to quantitative research approaches and instead prefer to write about the rigour of a study whether it is approached as qualitative or quantitative research. Similarly, in this study, I ensured that the qualitative and quantitative data collected from the narratives of 15 interviewees, the recorded descriptions of actions, views and experiences that I captured during observations, the entries from the surveying of 211 respondents and descriptions from document analysis were recorded as rigorously as possible to provide accurate information regarding the extent to which TTIs in Eswatini prepared PSTs for teaching and integrating ESE into their curriculum planning and teaching practices.

As the analysed results show in Chapter Five, the care taken to secure data that are trustworthy translates into accurately amplifying the voices of all the participants, respondents, analysed content and observed contexts that in the end should help to arrive at inferences that are valid and reliable. For this to be realised, ethical measures discussed in the next section must be in place to ensure that acceptable behaviour takes place.

4.6   ETHICAL MEASURES

As explained in Section 1.9 of Chapter One, this study has been undertaken in full compliance with all the ethical requirements outlined in the UNISA policy on research and ethics (UNISA, 2016). Ethics are principles or rules of behaviour that act to dictate what is acceptable in a given setting so that there is conformity to the standards of conduct of a given profession or group (O'Leary, 2017; Webster, 1987, s.v. "ethics").

Ethical research concerns focus on how researchers should behave while undertaking empirical research studies. The ethical issues that I considered included among others informed consent, confidentiality and anonymity on the one hand, and accessibility to the research field in as far as permissions, protections and privileges in my research undertaking are concerned on the other hand. Ethical decisions are multifaceted contextually situated considerations that touch on social aspects of research fields where ethical problems often result from thoughtlessness, oversight or taking matters for granted (Cohen *et al.,* 2018).

Babbie (2016) warns that anyone involved in social science research should be aware of the general agreements shared by researchers about what is proper and improper in the conduct of scientific inquiry. Lune and Berg (2017) point out that questionable research practices involving humans signalled the need for regulation to ensure that rights of individuals were protected. Furthermore, they caution that researchers have an ethical obligation to their colleagues, their study populations and the larger society because at the heart of every research undertaking is the possibility of socially intersecting with lived experiences of other human beings. Researchers must therefore ensure the rights, privacy and welfare of the people and communities that form the focus of their studies to guarantee what O'Leary (2017) refers to as the human dignity.

In this study, I anticipated that ethical issues could emerge knowing that I was dealing with human beings, and heeding the advice of Israel and Hay (2006), I sought to protect my research participants and respondents and to develop trust with them. Therefore, in order to promote the integrity of this study, I guarded against any form of misconduct and wrongdoing and was able to cope with challenging problems as I fully operated under the guidance of ethical requirements set by UNISA ethical committee (UNISA, 2016). I strictly adhered to what Creswell and Creswell (2018) advise that ethical issues should be prioritised before beginning the study by carefully considering

prescribed codes of ethics, during data collection, data analysis and at the research study stage of reporting, sharing and storing of primary data secured from the research field.

I also ensured that respondents and participants gave informed consent, were made to fully understand their requested involvement that had to do with sharing their time and lived experiences. I also ensured that all participants and respondents had reasonable intellectual capacity and psychological maturity, an aspect that O'Leary (2017) refers to as competence. To that effect, I made sure that the self-directed and self-determined choices were arrived at voluntarily. Such autonomy guaranteed them the right to discontinue the process of data collection at any point. The nature of the study and intended use of the study findings were discussed in all cases involving 15 participants and 211 respondents, which means that I avoided any form of deception, coercion and inducement. I also ensured that physical harm was prevented and so was the hard to detect psychological harm that as O'Leary (2017) points out, can manifest in form of resentment, anxiety, embarrassment or reliving unpleasant memories.

To that effect, I was sensitive to all cultural norms of all individuals that participated as I respected their individual spaces by protecting them from all forms of harm. Confidentiality and anonymity, the practice of protecting the identity of those producing research data O'Leary (2017) was ensured by hiding their identity. For the 211 respondents that completed the questionnaire, protection against identification was highlighted in the instructions on the survey tool. This means that anonymous data collected was not identifiable with any particular respondent. In the final research report, confidentiality was further achieved by not mentioning the names of the institutions that participated in this study.

Heeding the advice by O'Leary (2017), additional confidentiality and anonymity was realised by securing storage of raw data and restricting access to it with the plan to destroy it after seven years of storage. I ensured that all the primary data collected in this study were secured with a password and stored in an electronic memory storage device that was kept in a safe room with restricted access. After seven years from the date of completion of this study, all raw data will be deleted and any hand written and printed material associated with this study will also be destroyed.

Three important documents were obtained as part of compliance to prescribed ethical regulations. Firstly, I needed to secure a research ethics clearance certificate issued by the UNISA Research Ethics Committee (2021/06/09/33528985/12/AM). With this certificate secured, (see Appendix A), I sought permission from the Director of EMoET to be allowed to carry out research in government controlled educational institutions that in this study comprised of a TTI and two schools. I also used the UNISA ethics clearance certificate to obtain permission from the Vice Chancellor of institution TA to allow me to conduct my research at the faculty in her institution. Additionally, the certificate from UNISA Research Ethics Committee was used to secure permission to carry out research at EEA. After securing permission from the director of EMoET and the Vice Chancellor, I also applied for permission to each of the TTI heads and the two school principals. At individual level, I wrote letters to each of the respondents and participants, seeking their informed consent to participate in lesson observations, interviews and a survey. Letters were delivered using both face-to-face and e-mail delivery modes. As a researcher, I upheld scientific research integrity by acknowledging all referenced material. Samples of letters for securing permission are Appendix B and those of consent are Appendix C.

4.7   CHAPTER SUMMARY

This chapter has detailed the MMR approach adopted for this study that utilized a Mixed Methods Instrumental Multisite Case Study design with a parallel convergent approach. The empirical research philosophical clarity provided the philosophical perspectives of the methodology for this study. The chapter outlined the rigorous process of data gathering and data analysis by describing the methodological process and the research methods used in this study. Selection of participants and respondents, data collection methods and procedures were explained to provide a comprehensive rationale for what I did throughout this study to obtain research data. A detailed account of how data were analysed was then given to create an understanding of how primary data for this study was obtained and interpreted to answer the main research question. The chapter also included a discussion on how accurate and verifiable research accounts were provided in this study by outlining various strategies that were used to ensure rigour in the empirical research that was undertaken. The chapter ended with a description of how, in this study, ethical issues

were tackled. The next chapter presents data that were got from the research field and discusses in detail findings that emerged from analysing and interpreting that data.

CHAPTER FIVE
DATA ANALYSIS AND INTERPRETATION

5.1   INTRODUCTION

The preceding chapter described and explained the process and purpose of MMR as the research design, and the data collection and analysis procedures adopted in this study were outlined. The MMR design afforded the researcher the best way to investigate the extent to which PSTs in TTIs in Eswatini were being prepared for teaching and integrating ESE into their curriculum planning and teaching practices as both quantitative and qualitative data were collected. This chapter guided by the objectives of the study and following procedures detailed in the methodology presents the analysis and interpretation of the data that were collected.

5.2   RESEARCH PROCESS

The research process progressed well as I focused on the study's research activities (*cf.* Figure 4.1). Using the mixed methods design that Leavy (2017) refers to as a convergent parallel integrative design, I collected both qualitative and quantitative data separately in the same time frame of about six months. I had planned to conduct a survey involving 400 PSTs not only to investigate individual possession of knowledge on ESE issues but also the prevalence of pro-environmental attitudes. However, as a result of student unrests that characterised the academic year in which this study was conducted, I was only able to secure 211 completed questionnaires. Earlier, I had successfully carried out a pilot study in a TTI that in this study is referred to as institution TC, where 30 questionnaires were distributed to assess the effectiveness of the questionnaire as a data collecting instrument. By processing data of the 30 questionnaires, I confirmed that the questionnaire designed for this study would accurately capture the required data from PSTs. The questionnaire used in the pilot study was first pretested using nine carefully selected individuals who completed it twice, with the second round occurring after at least 24 hours. The two sets of scores were then used to carry out a test-retest measure of stability using the statistical measure Pearson r – the Pearson Product Moment Correlation Pearson r. The Pearson r (N=9) for knowledge on ESE issues was 0.869 and for the prevalence of environmental attitudes, it was 0.9811. These values indicated that the questionnaire

that would be used in the main study was reliable on account of the high correlation values, meaning that the degree to which the questionnaire, as an assessment tool, would produce stable and consistent results was high. Data of 211 PSTs were analysed using the IBM SPSS statistics programme version 28 of 2021.

The qualitative part of this study also progressed well and I was able to interview 14 out of the planned 15 participants. Twelve interviews were conducted face-to-face and two via Zoom. The 15th participant who had agreed to participate using the cell phone requested to terminate the interview almost immediately after he felt that the questions on ESE that I was posting were difficult to answer. In the same period in which I conducted the interviews, I also carried out lesson observations for each of the four PST participants and the data were analysed using analytical tools shown in Table 5.36 and Appendix K. Even though I had planned to carry out lesson observations for each of the lecturers that I interviewed, it was not possible to do so because teaching and learning was more often than not conducted via online platforms that included among others, WhatsApp, Google Classroom and Zoom learning platforms. As a result, the learning sites were not accessible because lessons were not only conducted in a non-scheduled manner, but also took place in undesignated places such as homes.

The part of data collection involving lesson observations was on more than one occasion disrupted. Whereas it was possible to observe PSTs participating in teaching practice at institution TA, the class boycotts at institution TE interfered with their scheduled teaching practice engagements in primary schools, forcing the institution to assess the year three STD candidates using a micro-teaching approach. To that effect, whereas the lesson observation data analysed for institution TA was captured in primary school lesson settings, that of institution TE was observed during the micro-teaching exercise – an alternative approved by the EMoET.

Content analysis of curriculum documents was conducted to discover the extent to which the documents contributed to preparing PSTs for teaching and integrating ESE. I used analytical frameworks (*cf.* Tables: 5.34 and 5.35) to analyse curriculum documents in the official recontextualisation field, the pedagogic recontextualisation field and the reproduction field, three of which have been explained in Section 5.33.

The last part of qualitative data collection was field observation and observations in practice in institutions TA, TE, PI and P2.

5.3   DATA ANALYSIS

As explained in Section 4.4.3, I utilised what Creswell and Creswell (2018) refer to as the single-phase approach of convergent mixed methods design to analyse the quantitative and qualitative data that were separately collected (*cf*. 1.7.2.2). In the next section, I present the analysis of quantitative data and the results that emerged using descriptive and inferential data analysis techniques.

5.3.1   Data Analysis Using Descriptive and Inferential Statistics

In this section, the descriptive statistics shows how the 211 PSTs that took part in this study were distributed according to their gender, age range, region of origin, location of residence and year of study. The overall distribution of knowledge on ESE issues as well as the distribution of the prevalence of pro-environmental attitudes is presented as Figures 5.8 and 5.9 respectively (*cf*. 5.3.1.2.6). The combined mean score – out of 30 – for knowledge on ESE issues for institutions TA and TE was 18.5(61.7%) and the combined mean score out of 60 for pro-environmental attitudes for institutions TA and TE was 25.1(41.8%). The separate mean scores – out of 30 – for knowledge on ESE issues for institutions TA and TE were respectively 19.0(63.3%) and 17.1(57%) and out of 60, the separate mean score for pro-environmental attitudes for institutions TA and TE were 28.8(48%) and 12.7(21.2%) respectively. Additionally, I present results from inferential data analysis that I carried out to determine significance levels of associations linked to knowledge on ESE issues and the prevalence of pro-environmental attitudes. Even though Section 5.4 of this study is reserved for data interpretation, the meanings of the chi-square result were given in this section of data analysis to assist the reader to better understand what the data figures were saying regarding the particular variable analysed.

5.3.1.1   Knowledge on ESE issues and socio-demographics

The inferential statistics applied in this section provides what Polit and Beck (2017) refer to as a framework for making objective judgements about the reliability of sample estimates based on the laws of probability. Inferential statistics, they add, provide a means for drawing conclusions about a population. The statistical testing of

hypotheses allowed me to make objective decisions about whether the study results reflected sample differences arrived at by chance or were a result of true population differences (Polit & Beck, 2017). Using what Dunlap (2016) calls statistical procedures, I assumed null hypotheses for each of the variables that were selected and then tested them using chi-square test procedures.

5.3.1.1.1 Knowledge on ESE issues and gender

Gender was viewed as a key demographic element to ascertain whether or not it played any role in the distribution of knowledge on ESE issues as PSTs were prepared to teach and integrate ESE into their curriculum planning and teaching practices.

Of the 211 PSTs that took part in this study, 121(57.3%) were female while 90(42.7%) were males (refer to Figure 5.1).
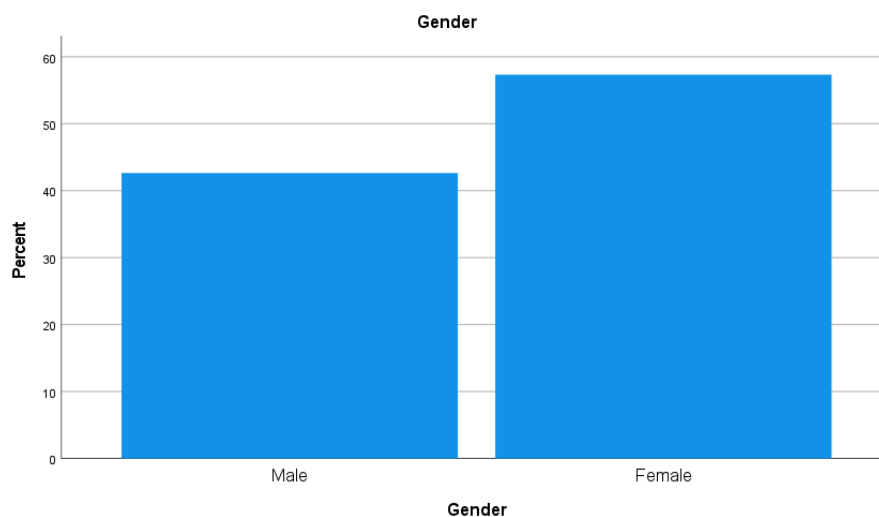
Figure 5.1: Distribution of respondent's gender (N = 211)

Of the 121 females, 109(90.1%) scored 50% or more. Of the 90 males, 74(82.2%) scored 50% or more (refer to Table 5.1).

Table 5.1: Knowledge on ESE issues and gender (N = 211)

			Gender		
			Male	Female	Total
Knowledge score	Knowledge at 50% or more	Count	74	109	183
		% within Gender	82.2%	90.1%	86.7%
	Knowledge at less than 50%	Count	16	12	28
		% within Gender	17.8%	9.9%	13.3%
	Total	**Count**	90	121	211
		% within Gender	100.0%	100.0%	100.0%

Regarding the relationship between gender and knowledge on ESE issues, the guiding null hypothesis was that there is no relationship between knowledge on ESE issues and genders of PSTs. To test the significance of the association between knowledge on ESE issues and gender in order to confirm that the variations observed from the knowledge scores of male and female PSTs was not by chance, a Chi-square test was performed (refer to Table 5.2).

Table 5.2: Chi-square test of knowledge on ESE issues and gender (p = 0.05)

	Value	df	Asymp.Sig.(2 sided)
Pearson Chi-square	2.771	1	0.096
No. of Valid Cases	211		

The results of the Chi-square test indicate that the calculated Chi-square value equal to 2.771 is less than the critical Chi-square value of 3.84 at 0.05 p value (probability level) and 1 degree of freedom. In addition, the Asymptotic Significance (2-sided) value, 0.096 is greater than 0.05. According to Cliffe (2019) and Crowson (2020), the association between two variables is statistically significant if Asymptotic Significance (2-sided) is less than 0.05. The phrase '2-sided', they add, refers to the alternative hypothesis tested which is that the distribution of cases in the crosstab can either be positively associated or negatively associated against the null hypothesis of no association. Accordingly, the null hypothesis is accepted; that is, there is no statistically significant relationship between knowledge on ESE issues and gender meaning that the PSTs' knowledge on ESE issues does not depend on whether one is male or female. This finding on gender is in line with the constructivist theories of

learning that emphasise the construction of knowledge by individuals, based on experiences in authentic natural settings (*cf.* 1.3).

The current study findings agree with those of Sarkawi, Priadi and Oktaviami (2017) who found that gender did not significantly influence environmental knowledge. In similar research carried out by Hassan, Rahman and Abdullah (s.a.), when they investigated the level of environmental knowledge, awareness, attitudes and practices in Malaysia, they found that students had the knowledge and pro-environmental attitudes but there was no significant difference based on gender in relation to knowledge possession on ESE issues. Female students were however found to have higher pro-environmental attitudes when compared to their male counterparts.

As pointed out by Offorma (2009), in many African households, social and cultural patterns place education of females in a place of vulnerability. However, it is worth noting that the quality of education opportunities given to PSTs in Eswatini is the same for both genders and to date, TTIs have endeavoured to eliminate gender-biased curriculum practices. In institutions TA and TE, the enrichment of learning content and the facilitation of knowledge transfer in ESE learning spaces – referred to by Swinkels, Koopman and Beijaard (2013) – take place in teaching and learning experiences that are not gender biased.

5.3.1.1.2 Knowledge on ESE issues and age

Of the 211 PSTs that participated in this study, 97(46%) were less than 25 years of age while 114(54%) were 25 or older (refer to Figure 5.2).
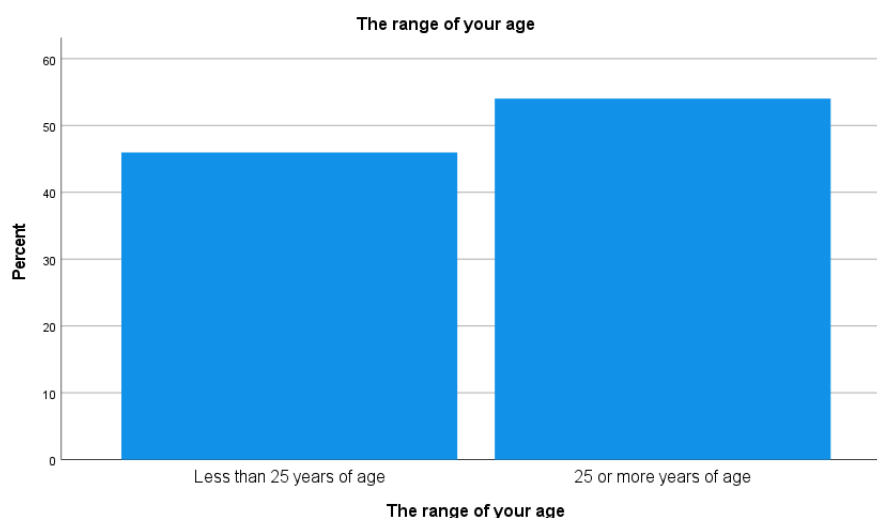
Figure 5.2: Distribution of respondent's age (N = 211)

Of the 97 participants mentioned, 85(87.6%) scored 50% or above. Of the 114 aged 25 or more, 98(86.0%) scored 50% or above. The percentage scores for both age ranges are close to each other suggesting that the ESE knowledge level could be evenly distributed, hence the assumption that there is no relationship between age and knowledge on ESE issues among PSTs. In this case, the null hypothesis assumes that knowledge on ESE issues is independent of age (refer to Table 5.3).

Table 5.3: Knowledge on ESE issues and age (N = 211)

			Age range		
			Less than 25 years of age	25 years or more	Total
Knowledge	Knowledge at 50% or more	Count	85	98	183
score	% within Age range		87.6%	86.0%	86.7%
	Knowledge at less than 50% Count		12	16	28
	% within Age range		12.4%	14.0%	13.3%
	Total Count		97	114	211
	% within Age range		100.0%	100.0%	100.0%

Therefore, in order to test the significance of the association between knowledge on ESE issues and age to be able to conclude that the variations observed from the knowledge scores of the two age ranges is not by chance, a Chi-square test was performed (refer to Table 5.4).

Table 5.4: Chi-square test of knowledge on ESE issues and age (p = 0.05)

	Value	df	Asymp.Sig.(2 sided)
Pearson Chi-square	0.126	1	0.723
No. of Valid Cases	211		

The Chi-square test result presented in Table 5.4 indicates that the calculated Chi-square value equal to 0.126 is less than the critical Chi-square value of 3.84 at 0.05 probability level and 1 degree of freedom. In addition, the Asymptotic Significance (2-sided) value, 0.723 is greater than 0.05. This means that there is no statistically significant relationship between knowledge on ESE issues and the age of PSTs. The

findings relating to age range reflect the fact that PSTs at institutions TA and TE are admitted on merit with little or no consideration of age as most of them are admitted after completing high school education. Empirical literature findings by Togo (2009) who investigated the role students play as change agents also point to the fact that irrespective of gender or age, the role of being active agents – Agency – among students motivated them to meaningfully engage in sustainability activities.

5.3.1.1.3   Knowledge on ESE issues and region of origin

The distribution pattern of the 211 PSTs that took part in this study in relation to the four regions in Eswatini – refer to Figure 5.3 – was such that 51(24.2%) were from Hhohho Region, 70(33.2%) were from Manzini Region, 49(23.2%) were from Shiselweni Region and 41(19.4%) were from Lubombo Region.
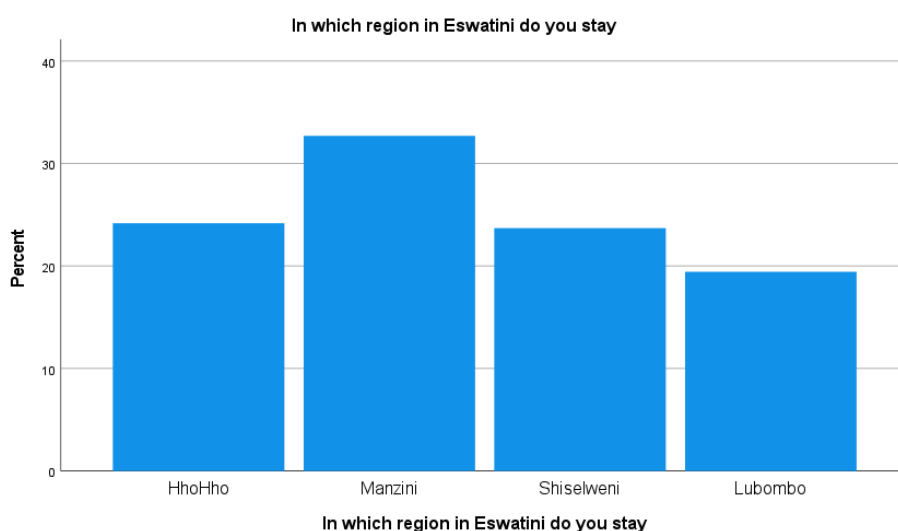
Figure 5.3: Respondents' region (N = 211)

Table 5.5 shows how knowledge on ESE issues was distributed in the four regions.

Table 5.5: Knowledge on ESE issues and region (N = 211)

			Region in Eswatini				
			Hhohho	Manzini	Shiselweni	Lubombo	Total
Knowledge score	Knowledge at 50% or more	Count	46	63	40	34	183
	% within Region in Eswatini		90.2%	90.0%	81.6%	82.9%	86.7%
	Knowledge at less than 50%	Count	5	7	9	7	28
	% within Region in Eswatini		9.8%	10.0%	18.4%	17.1%	13.3%
	Total	**Count**	51	70	49	41	211
	% within Region in Eswatini		100.0%	100.0%	100.0%	100.0%	100.0%

From the results in Table 5.5 above, the assumption raised would be that there was an association between knowledge on ESE issues and the region where PSTs lived. Based on the null hypothesis that there is no relationship between knowledge on ESE issues and the region where PSTs originated, a Chi-square test was performed to test this relationship.

The Chi-square result – presented in Table 5.6 – equal to 2.804 was less than the critical Chi-square value of 7.82 at 0.05 p value and 3 degrees of freedom. In addition, the Asymptotic Significance (2-sided) value, 0.423 is greater than 0.05. Therefore, the null hypothesis that there is no statistically significant relationship between ESE knowledge levels and the region in Eswatini where PSTs originated, is accepted. This result is important in this study in that it confirms that not only were all the four regions fairly represented, but also that knowledge on ESE issues was fairly distributed even though the region where PSTs came from did not significantly influence that knowledge among them.

Table 5.6: Chi-square test of knowledge on ESE issues and region (p = 0.05)

	Value	df	Asymp.Sig. (2-sided)
Pearson Chi-square	2.804	3	0.423
No. of Valid Cases	211		

5.3.1.1.4 *Knowledge on ESE issues and location of residence*

Of the 211 PSTs who participated in this study, 55(26.0%) resided in urban areas and 156(74.0%) resided in rural settings (refer to Figure 5.4 and Table 5.7).

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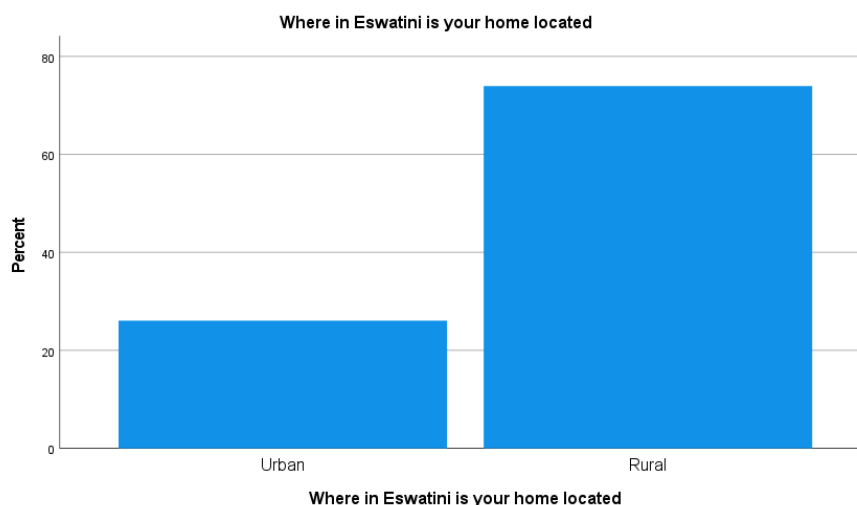
Figure 5.4: Respondents' location of residence (N = 211)

A Chi-square test was performed to test the assumption that knowledge on ESE issues was not associated with PSTs' location of residence.

Table 5.7: Knowledge on ESE issues and location of residence (N = 211)

			Location of residence		
			Urban	Rural	Total
Knowledge	Knowledge at 50% or more	Count	47	136	183
score	% within Location of residence		85.5%	87.2%	86.7%
	Knowledge at less than 50%	Count	8	20	28
	% within Location of residence		14.5%	12.8%	13.3%
	Total	**Count**	55	156	211
	% within Location of residence		100.0%	100.0%	100.0%

In this test, the null hypothesis assumes that knowledge on ESE issues is independent of location of residence of PSTs. The result of the Chi-square test – as indicated in Table 5.8 – is equal to 0.105, a value less than the critical Chi-square value of 3.84 at p value 0.05 and 1 degree of freedom. In addition, the Asymptotic Significance (2-sided) value, 0.746 is greater than 0.05. This means that there is no relationship between knowledge on ESE issues and the location of residence of PSTs.

Table 5.8: Chi-square test of knowledge on ESE issues and location of residence (p = 0.05)

	Value	df	Asymp.Sig. (2-sided)
Pearson Chi-square	0.105	1	0.746
No. of Valid Cases	211		

5.3.1.1.5 *Knowledge on ESE issues and year of study*

Of the 211 PSTs that participated in this study, 68(32.2%) were continuing students, that is, year ones and year twos while 143(67.8%) were year three finalist PSTs (refer to Figure 5.5).
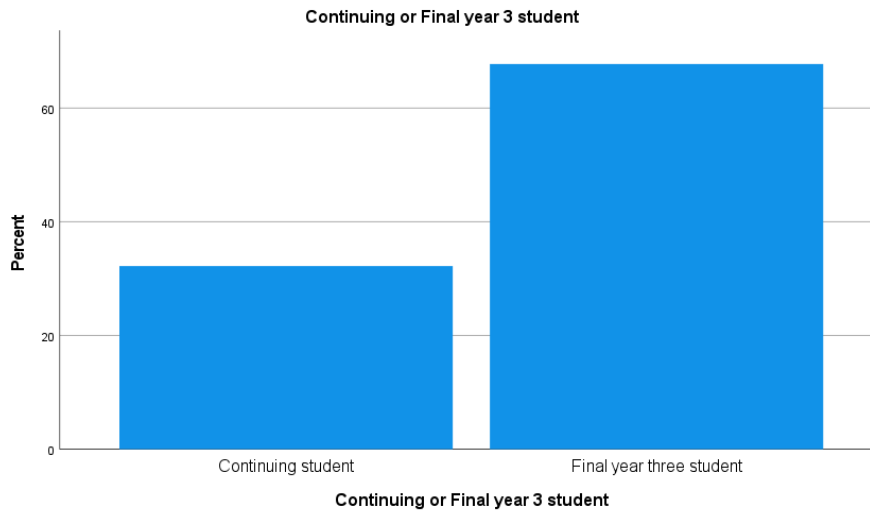
Figure 5.5: Respondents' year of study (N = 211)

Of the 68 students mentioned, 60(88.2%) scored 50% or above. Of the 143-year three finalist students, 123(86.0%) scored 50% or above. The percentage scores for both years of study ranges are close to each other hence the assumption that knowledge on ESE issues could be evenly distributed among PSTs throughout the three years of study. In addition, the null hypothesis assumes that knowledge on ESE issues is independent of the year of study among PSTs (refer to Table 5.9).

Table 5.9: Knowledge on ESE issues and year of study (N = 211)

			Year of study		
			Continuing students, year ones and twos	Year three finalist students	Total
Knowledge score	Knowledge at 50% or more	Count	60	123	183
	% within year of study		88.2%	86.0%	86.7%
	Knowledge at less than 50%	Count	8	20	28
	% within year of study		11.8%	14.0%	13.3%
	Total	**Count**	68	143	211
	% within year of study		100.0%	100.0%	100.0%

Therefore, in order to test the significance of the association between knowledge on ESE issues and year of study to be able to confirm that the variations observed from the knowledge scores of the two age ranges just mentioned is not by chance, a Chi-square test was performed (refer to Table 5.10).

Table 5.10: Chi-square test of knowledge on ESE issues and year of study (p = 0.05)

	Value	df	Asymp.Sig. (2-sided)
Pearson Chi-square	0.198	1	0.657
No. of Valid Cases	211		

The Chi-square test result presented in Table 5.10 indicates that the calculated Chi-square value equal to 0.198 is less than the critical Chi-square value of 3.84 at 0.05 probability level and 1 degree of freedom. In addition, the Asymptotic Significance (2-sided) value, 0.657 is greater than 0.05. This means that there is no statistically significant relationship between knowledge on ESE and the year of study.

Nazarenko and Kolesnik (2018) not only note that environmental knowledge was lacking among PSTs but they also argue that such knowledge that awakens students' cognitive processes is on its own incapable of shaping proactive and pro-environmental attitudes within individuals. The Chi-square result of no significance relationship between knowledge on ESE issues and the year of study confirms the observation by Nazarenko and Kolesnik (2018). This observation regarding the relationship between the year of study and knowledge of ESE issues among PSTs is in line with Qablan's (2018) argument that educators have failed to redirect the teaching and learning approaches in ESE learning spaces to promote professional development among learners. He implicitly advocates for the promotion of approaches that produce results such as those pointed out by Kopnina (2018) and O'Donoghue *et al.* (2018) (*cf.* 2.4.1, 2.5.2 and 2.6.1).

5.3.1.1.6 *Knowledge on ESE issues and the prevalence of pro-environmental attitudes*

Of the 211 PSTs surveyed in this study, 89(42.2%) had high positive attitude values meaning that they had a score value of 50% or above and 122(57.8%) had a score value that was either negative, neutral or low positive; that is, a score below 50%. Of the 89(42.2%) with a high positive attitude score, 83(93.3%) not only had a high positive attitude score, but also a knowledge score of 50% or more. A hundred (82.0%) had a negative, neutral or low positive score which was below 50% but a high knowledge score of 50% or more. 6(6.7%) had a high positive attitude score, but a knowledge score below 50%. Some 22(18.0%) had not only a negative, neutral or low

positive value, but also a knowledge score value of less than 50% (refer to Figures 5.6, 5.7 and Table 5.11).
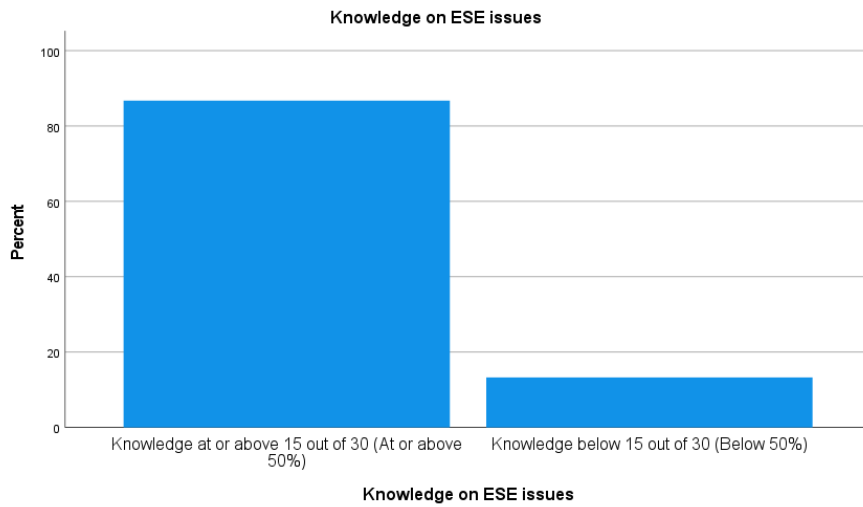
Figure 5.6: Distribution of respondents' knowledge on ESE issues (N = 211)
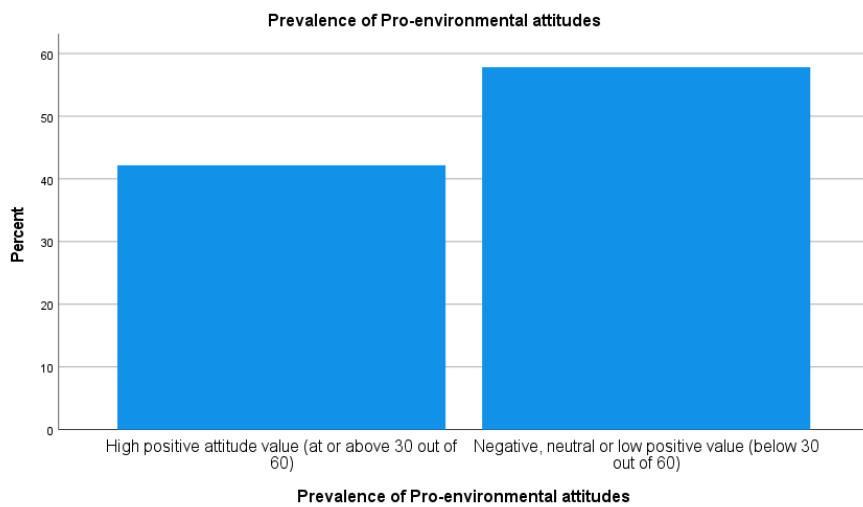
Figure 5.7: Distribution of respondents' pro-environmental attitudes (N = 211)

Table 5.11: Knowledge on ESE issues and the prevalence of pro-environmental attitudes (N = 211)

			Attitude score		
			High positive attitude value, 50% and above	Negative, neutral or low positive value below 50%	Total
Knowledge score	Knowledge at 50% or more	Count	83	100	183
	% within Attitude score		93.3%	82.0%	86.7%
	Knowledge below 50%	Count	6	22	28
	% within Attitude score		6.7%	18.0%	13.3%
	Total	**Count**	89	122	211
	% within Attitude score		100.0%	100.0%	100.0%

A Chi-square test based on the null hypothesis that there was no association between knowledge on ESE issues and the prevalence of pro-environmental attitudes among PSTs was carried out and the results presented in Table 5.12, show that a Chi-square test result equal to 5.700 was obtained at 1 degree of freedom (p = 0.05). In addition, the Asymptotic Significance (2-sided) value, 0.017 is less than 0.05. Since the Chi-square test result is greater than the critical Chi-square value of 3.84 at 1 degree of freedom (p = 0.05), the null hypothesis is rejected meaning that among PSTs, there is a relationship between the prevalence of pro-environmental attitudes and knowledge on ESE issues. This current finding was very useful when data from all sources used in this study were triangulated (*cf*. 5.4).

Table 5.12: Chi-square test of knowledge on ESE issues and the prevalence of pro-environmental attitudes (p = 0.05)

	Value	df	Asymp.Sig. (2-sided)
Pearson Chi-square	5.700	1	0.017
No. of Valid Cases	211		

The study findings on the relationship between knowledge on ESE issues and the prevalence of pro-environmental attitudes are in agreement with those of Janmaimool and Samattaphong (2019), who in a study which investigated the role of environmental knowledge in promoting pro-environmental attitudes and behaviours in Thailand, found that knowledge of the environment was related to environmental attitudes.

Sousa, Correia, Leite and Viseu (2021) also found that among HEI students in Portugal, most students not only had adequate environmental knowledge, but also

pro-environmental attitudes. In addition, most of the students Sousa *et al.* (2021) investigated considered themselves well informed about environmental issues. On the contrary, Sadik and Sadik (2014) observed that whereas PSTs had a moderate level of environmental knowledge, their levels of pro-environmental attitudes were higher but the combined effect of environmental knowledge and pro-environmental attitudes was not sufficient for them to act positively towards the environment.

The current findings on the relationship between knowledge on ESE issues and the prevalence of pro-environmental attitudes also contrast with those from a survey conducted in Iran by Maleki (2011) to establish the relationship between environmental knowledge and pro-environmental attitudes. In that study, Maleki (2011) found that there was no statistically significant relationship between environmental knowledge and pro-environmental attitudes even though to a certain extent, pro-environmental attitudes were observed to be present.

As part of seeking to establish the extent to which TTIs in Eswatini prepared PSTs for teaching and integrating ESE into their curriculum planning and teaching practices, I found it equally important to investigate the relationships between pro-environmental attitudes and the variables where the type of relationships with PSTs knowledge on ESE matters were revealed. The findings to establish the relationships between pro-environmental attitudes and selected variables are presented in the next section.

5.3.1.2   Prevalence of pro-environmental attitudes and socio-demographics

In this section, results from associations linked to establishing what patterns in the prevalence of pro-environmental attitudes existed as PSTs were prepared to teach and integrate ESE into their curriculum planning and teaching practices are presented.

5.3.1.2.1 Prevalence of pro-environmental attitudes and gender

Of the 211 PSTs that took part in this study, 121(57.3%) were female while 90(42.7%) were males. Of the 121 females, 52(43.0%) scored 50% or above. Of the 90 males, 37(41.1%) scored 50% or above (refer to Table 5.13).

Table 5.13: Prevalence of pro-environmental attitudes and gender (N = 211)

	Gender		
	Male	Female	Total

Attitude	High positive attitude score, 50% and above Count	37	52	89
score	% within Gender	41.1%	43.0%	42.2%
	Negative, neutral or low positive score below 50% Count	53	69	122
	% within Gender	58.9%	57.0%	57.8%
Total	Count	90	121	211
	% within Gender	100.0%	100.0%	100.0%

In order to establish the relationship between gender and the prevalence of pro-environmental attitudes, the null hypothesis that there was no statistically significant relationship between pro-environmental attitudes and genders of PSTs was assumed. To test the significance of the association between pro-environmental attitudes and gender in order to confirm that the variations observed from the attitudes scores of male and female PSTs was not by chance, a Chi-square test was performed (refer to Table 5.14)

Table 5.14: Chi-square test of prevalence of pro-environmental attitudes and gender (p = 0.05)

	Value	df	Asymp.Sig.(2 sided)
Pearson Chi-square	0.074	1	0.786
No. of Valid Cases	211		

The results of the Chi-square test indicate that the calculated Chi-square value equal to 0.074 is less than the critical Chi-square value of 3.84 at 0.05 p value (probability level) and 1 degree of freedom. Accordingly, the null hypothesis is accepted; that is, there is no statistically significant relationship between the prevalence of pro-environmental attitudes and gender. The prevalence of pro-environmental attitudes among PSTs does not depend on whether one is male or female.

5.3.1.2.2 *Prevalence of pro-environmental attitudes and age*

Of the 211 PSTs that participated in this study, 97(46%) were less than 25 years of age while 114(54%) were 25 or more years old. Of the 97, 43(44.3%) scored 50% or above. Of the 114 aged 25 or more, 46(40.4%) scored 50% or above. Worth noting is the fact that PSTs less than 25 years of age had a higher percentage score rating for high positive attitude scores (44.3%) compared to 40.4% of PSTs aged 25 years or

above. The percentage scores for both age ranges are close to each other, hence it could be assumed that the prevalence of pro-environmental attitudes are evenly distributed. I was thus guided by the null hypothesis that there is no statistically significant relationship between age and the prevalence of pro-environmental attitudes among PSTs (refer to Table 5.15).

Table 5.15: Prevalence of pro-environmental attitudes and age (N = 211)

			Age range		
			Less than 25 years of age	25 or more years of age	Total
Attitude score	High positive attitude score, 50% and above	Count	43	46	89
	% within Age range		44.3%	40.4%	42.2%
	Negative, neutral or low positive score below 50%	Count	54	68	122
	% within Age range		55.7%	59.6%	57.8%
Total		**Count**	97	114	211
	% within Age range		100.0%	100.0%	100.0%

In order to test the significance of the association between prevalence of pro-environmental attitudes and age to be able to confirm that the variations observed from the prevalence of pro-environmental attitudes scores of the two age ranges just mentioned was not by chance, a Chi-square test was performed (refer to Table 5.16).

Table 5.16: Chi-square test of prevalence of pro-environmental attitudes and age (p = 0.05)

	Value	df	Asymp.Sig. (2-sided)
Pearson Chi-square	0.340	1	0.560
No. of Valid Cases	211		

The Chi-square test result presented in Table 5.16 indicates that the calculated Chi-square value equal to 0.340 is less than the critical Chi-square value of 3.84 at 0.05 probability level and 1 degree of freedom. In addition, the Asymptotic Significance (2-sided) value, 0.560 is greater than 0.05. The null hypothesis is therefore accepted meaning that there is no statistically significant relationship between prevalence of pro-environmental attitudes and the age of PSTs. The findings relating to age range reflect the fact that the majority of PSTs at institutions TA and TE are admitted after completing their high school with hardly any consideration of age.

According to Wiernik, Ones and Dilchert (2013), individuals of different ages hold different environmental attitudes to varying degrees. They observed that older individuals appear to have more pro-environmental attitudes. Wang, Hao and Liu (2021) who gathered data from 31 countries in a research task involving environmental attitudes and age, observed a positive relationship between aging and pro-environmental behaviour. Pro-environmental attitude levels were not only higher at the individual level among older people but were also found to be higher at national level.

5.3.1.2.3 Prevalence of pro-environmental attitudes and region of origin

The distribution pattern of the 211 PSTs in relation to the four regions in Eswatini was such that 51(24.2%) were from the Hhohho region, 70(33.2%) were from the Manzini region, 49(23.2%) were from the Shiselweni region and 41(19.4%) were from the Lubombo region. Table 5.17 shows how the prevalence of pro-environmental attitudes were spread out in the four regions in Eswatini.

Table 5.17: Prevalence of pro-environmental attitudes and region (N = 211)

		Region in Eswatini				
		HhoHho	Manzini	Shiselweni	Lubombo	Total
Attitude score	High positive attitude score, 50% and above Count	19	32	19	19	89
	% within Region in Eswatini	37.3%	46.4%	38.0%	46.3%	42.2%
	Negative, neutral or low positive score below 50% Count	32	37	31	22	122
	% within Region in Eswatini	62.7%	53.6%	62.0%	53.7%	57.8%
Total	**Count**	51	70	49	41	211
	% within Region in Eswatini	100.0%	100.0%	100.0%	100.0%	100.0%

From the results in Table 5.17, the assumption raised would be that there is an association between the prevalence of pro-environmental attitudes and the region where PSTs lived. Based on the null hypothesis that there is no relationship between the prevalence of pro-environmental attitudes and the region where respondents live, a Chi-square test was performed to test this relationship.

Table 5.18 presents the Chi-square result equal to 1.655 was less than the critical Chi-square value of 7.82 at 0.05 p value and 3 degrees of freedom. In addition, the Asymptotic Significance (2-sided) value, 0.647 is greater than 0.05. The null hypothesis that there is no statistically significant relationship between the prevalence

of pro-environmental attitudes and the region in Eswatini where PSTs originated was therefore accepted.

Table 5.18: Chi-square test of prevalence of pro-environmental attitudes and region (p = 0.05)

	Value	df	Asymp.Sig. (2-sided)
Pearson Chi-square	1.655	3	0.647
No. of Valid Cases	211		

5.3.1.2.4 Prevalence of pro-environmental attitudes and year of study

Of the 211 PSTs that participated in this study, 68(32.2%) were continuing students, year one and year two students, while 143(67.8%) were year three finalist students. Of the 68 students, 34(50.0%) scored 50% or above. Of the 143-year three finalist students, 55(38.5%) scored 50% or above. The assumption raised from the data just presented would be that there is a relationship between the year of study and the prevalence of pro-environmental attitudes among PSTs since the scores were far apart. In this case, the null hypothesis assumes that pro-environmental attitudes are independent of PSTs' year of study (refer to Table 5.19).

Table 5.19: Prevalence of pro-environmental attitudes and year of study (N = 211)

			Year of study		
			Continuing students, years one and two	Finalist, year three students	Total
Attitude score	High positive attitude score, 50% and above	Count	34	55	89
		% within year of study	50.0%	38.5%	42.2%
	Negative, neutral or low positive score below 50%	Count	34	88	122
		% within year of study	50.0%	61.5%	57.8%
	Total	**Count**	68	143	211
		% within year of study	100.0%	100.0%	100.0%

Therefore, in order to test the significance of the association between the prevalence of pro-environmental attitudes and the year of study to be able to confirm that the variations observed from the pro-environmental attitudes scores of the two age ranges just mentioned was not by chance, a Chi-square test was performed (refer to Table 5.20).

Table 5.20: Chi-square test of prevalence of pro-environmental attitudes and year of study (p = 0.05)

	Value	df	Asymp.Sig. (2-sided)
Pearson Chi-square	2.516	1	1.113
No. of Valid Cases	211		

The Chi-square test result presented in Table 5.20 indicates that the calculated Chi-square value equal to 2.516 is less than the critical Chi-square value of 3.84 at 0.05 probability level and 1 degree of freedom. In addition, the Asymptotic Significance (2-sided) value, 1.113 is greater than 0.05. This means that there is no statistically significant relationship between the prevalence of pro-environmental attitudes and PSTs' year of study.

5.3.1.2.5   *Prevalence of pro-environmental attitudes and location of residence*

Of the 211 PSTs who participated in this study, 55(26.0%) resided in urban areas and 156(74.0%) resided in rural settings (refer to Table 5.21). Given the large differences between the urban and rural attitude scores, it could be assumed that pro-environmental attitudes were associated with the location of one's residence.

Table 5.21: Prevalence of pro-environmental attitudes and location of residence (N = 211)

			Location of residence		
			Urban	Rural	Total
Attitude score	High positive attitude score, 50% and above	Count	18	71	89
	% within Location of residence		32.7%	45.5%	42.2%
	Negative, neutral or low positive score below 50%	Count	37	85	122
	% within Location of residence		67.3%	54.5%	57.8%
	Total **Count**		55	156	211
	% within Location of residence		100.0%	100.0%	100.0%

A Chi-square test was performed guided by the null hypothesis that assumed that pro-environmental attitudes were not associated with the location of PST residence. The result of the Chi-square test indicated in Table 5.22 is equal to 2.726, a value less than the critical Chi-square value of 3.84 at p value 0.05 and 1 degree of freedom. In addition, the Asymptotic Significance (2-sided) value, 0.099 is greater than 0.05. The

null hypothesis is accepted meaning that there is no relationship between the prevalence of pro-environmental attitudes and the location of residence of PSTs.

Table 5.22: Chi-square test of prevalence of pro-environmental attitudes and location of residence (p = 0.05)

	Value	df	Asymp.Sig. (2-sided)
Pearson Chi-square	2.726	1	0.099
No. of Valid Cases	211		

Even though the results from this study indicate that there was no relationship between the prevalence of pro-environmental attitudes and the location of residence of PSTs, White and Reid (2008) suggest that PSTs can be better prepared when their contextual settings – such as residence location – are considered in teacher education curriculum practices. Franklin (2011) also adds that to be rural is a concept in the mind that operates beyond the context of 'not being urban' and this, he concludes, results in people perceiving sustainability matters differently.

5.3.1.2.6 *Knowledge on ESE issues and prevalence of pro-environmental attitudes in institutions TA and TE*

As part of this study, the researcher investigated how the two TTIs, which prepared PSTs for teaching and integrating ESE into their curriculum planning and teaching practices, compared not only in the aspect of knowledge on ESE issues, but also regarding the prevalence of pro-environmental attitudes. Figures 5.8 and 5.9 respectively show the distribution of combined scores of knowledge on ESE issues and pro-environmental attitudes of the 211 respondents from institutions TA and TE.
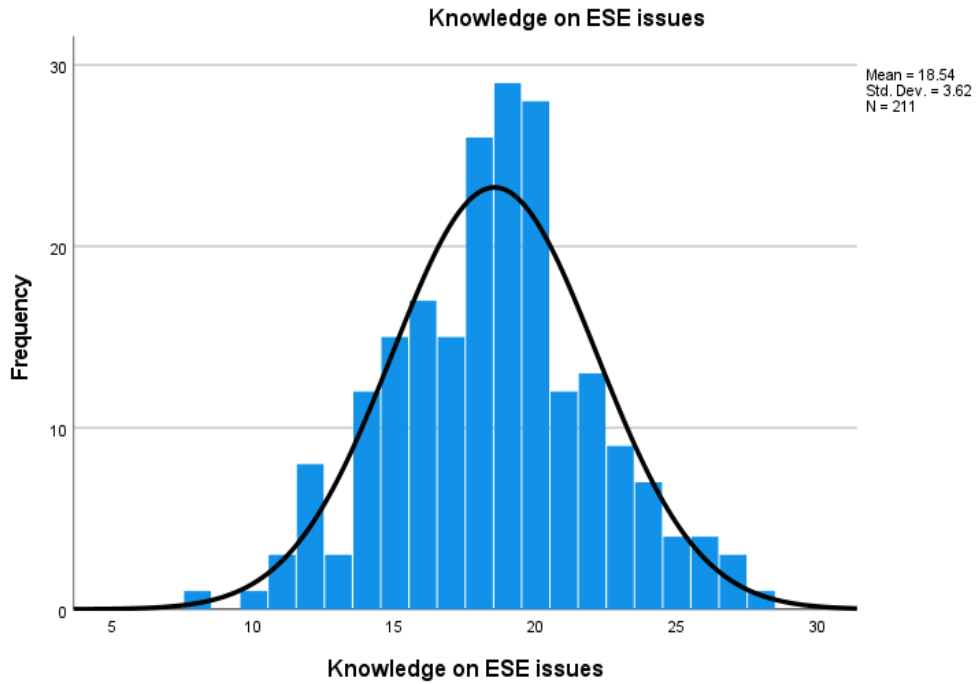
Figure 5.8: Distribution of knowledge on ESE issues in institutions TA and TE (N = 211)
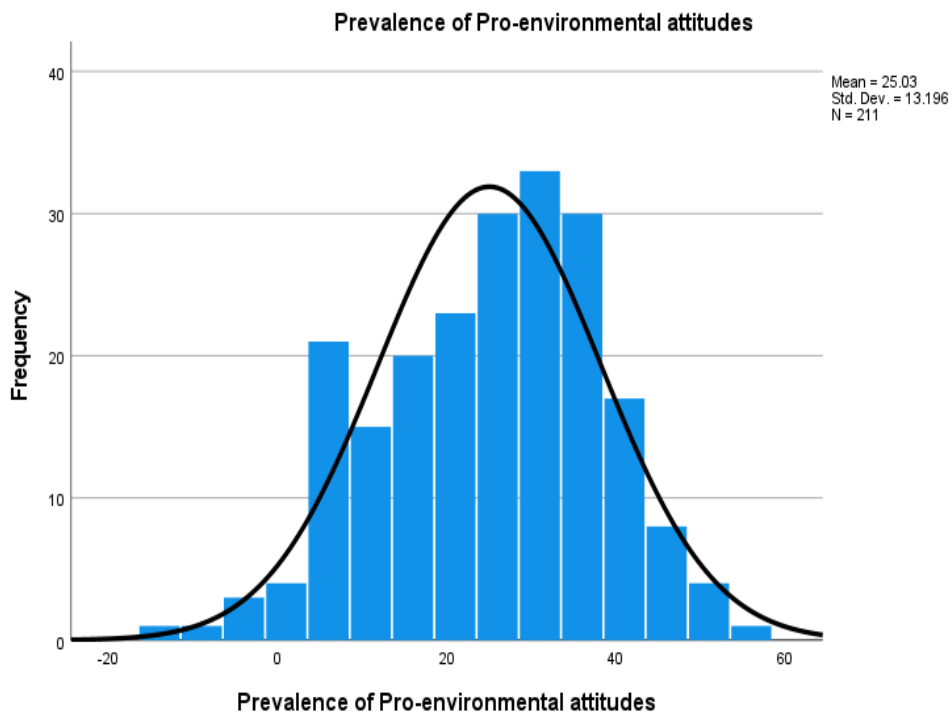
Figure 5.9: Distribution of pro-environmental attitudes in institutions TA and TE (N = 211)

5.3.1.2.7 Knowledge on ESE issues in institutions TA and TE

Of the 211 PSTs that took part in this study, 162(76.8%) were from institution TA and 49(23.2%) were from institution TE. As explained in Section 5.2, it had originally been planned that a total of 400 PSTs would take part in the survey for this study. As shown in Table 5.23, 147(90.7%) of PSTs in institution TA obtained a score of 50% or more in relation to knowledge on ESE issues compared to 36(73.5%) of PSTs in institution TE.

Table 5.23: Knowledge on ESE issues in Institutions (N = 211)

| | | | Institution | | |
			TA	TE	Total
Knowledge	Knowledge at 50% or more	Count	147	36	183
score	% within Institution		90.7%	73.5%	86.7%
	Knowledge at less than 50%	Count	15	13	28
	% within Institution		9.3%	26.5%	13.3%
Total		**Count**	162	49	211
	% within Institution		100.0%	100.0%	100.0%

Given the wide difference in percentage values for the two teacher training institutions, the findings raise the assumption that there is a relationship between knowledge on ESE issues and the institutions where PSTs are prepared for teaching and integrating ESE into their curriculum planning and teaching practices. Additionally, the null hypothesis assumes that knowledge on ESE issues is independent of the institution where PSTs are trained. Therefore, in order to test whether or not there was a relationship between knowledge on ESE issues and the institution where PSTs were trained, a Chi-square test was performed and the Chi-square value obtained as 9.751 was greater than the critical value 3.84 at p value 0.05 and 1 degree of freedom (refer to Table 5.24). Moreover, the Asymptotic Significance (2-sided) value, 0.002 is less than 0.05, which means that there is a statistically significant relationship between the institution where a PST is trained and knowledge on ESE issues.

Table 5.24: Chi-square test of Knowledge on ESE issues in Institutions TA and TE (p = 0.05)

	Value	df	Asymp.Sig. (2-sided)
Pearson Chi-square	9.751	1	0.002
No. of Valid Cases	**211**		

In the next section, the researcher sought to establish whether or not there was a relationship between the prevalence of pro-environmental attitudes and the institutions where PSTs were trained.

5.3.1.2.8 *Prevalence of pro-environmental attitudes in institutions TA and TE*

Comparing the two institutions that took part in this study, 79(48.8%) PSTs from institution TA obtained a high positive attitude score of 50% or more compared to 5(10.2%) PSTs from institution TE (refer to Table 5.25).

Table 5.25: Prevalence of pro-environmental attitudes in Institutions (N = 211)

		Institution		
		TA	TE	Total
Attitude score	High positive attitude score, 50% and above Count	79	5	84
	% within Institution	48.8%	10.2%	39.8%
	Negative, neutral or low positive score below 50% Count	83	44	127
	% within Institution	51.2%	89.8%	60.2%
	Total **Count**	162	49	211
	% within Institution	100.0%	100.0%	100.0%

The current study results – indicated by the differences between percentage values within each institution – suggest that there is an association between the institution attended by a PST and the prevalence of pro-environmental attitudes. To test whether such an association existed, a Chi-square test was performed from which the result of 23.346 was obtained, a value greater than the critical value 3.84 at p value 0.05 and 1 degree of freedom. The Asymptotic Significance (2-sided) value shown to be less than 0.001 is less than 0.05 (refer to Table 5.26), which means that there is a statistically significant relationship between the prevalence of pro-environmental attitudes and the institutions where PSTs are trained.

Table 5.26: Chi-square test of prevalence of pro-environmental attitudes in Institutions (p = 0.05)

	Value	df	Asymp.Sig. (2-sided)
Pearson Chi-square **No. of Valid Cases**	23.346 **211**	1	<0.001

5.3.2 Interview Data

In this section, the analysis and interpretation of data from interviews is presented. The data collected from 15 participants (*cf.* Table 5.27) through semi-structured interviews is presented using the themes which emerged.

Table 5.27: Interviewed participants' qualifications information

Participant category	Participant code	Participant highest qualification
Institution leaders	L1	PhD
	L2	M.Ed.
	L3	M.Ed.
Lecturers	T1	M.Ed.
	T2	M.Ed.
	T3	PhD
	T4	M.Ed.
	T5	M.Ed.
	T6	M.Ed.
Students	S1	PTD candidate
	S2	PTD candidate
	S3	STD candidate
	S4	STD candidate
Officials	O1	PhD
	O2	MA

The categories out of which each theme emerged were developed to answer the main research question: *To what extent are pre-service teachers being prepared to integrate ESE knowledge, skills and attitudes into the Eswatini school curriculum?*

5.3.2.1 Thematic discussion

Three themes aligned with the research questions emerged from qualitative data analysis. The themes are: ESE mediation experiences; Interfacing SDG 4, targets 4.7 and 4c with TTI curriculum practices; and support for effective ESE integration into TTI curriculum practices (*cf.* Appendix J).

Theme One: ESE mediation experiences

The theme, ESE mediation experiences, emerged from categories that highlighted experiences of participants as PSTs were prepared for teaching and integrating ESE into their curriculum planning and teaching practices. The categories that gave rise to the theme are: Quality of ESE mediated, utilisation of online educational platform

services, use of physical structures and grounds and observed transformation of PSTs. The four categories are discussed in the subsequent headings.

Category one: Quality of ESE mediated

The current mode of teaching – predominantly using the lecture method – was referred to by two institution leaders possibly hinting on its limitations to effectively mediate ESE among PSTs. The first leader said, *'The current lecturing needs to be translated into a living experience. There is a lot of head knowledge experience.'* (L2)

Her words were echoed by the second leader who asserted, *'One thing I observed is that it's very hard to change academics from lecturing. What we normally encourage among the lecturers is team work – team teaching.'* (L3)

Blake *et al.* (2013) caution that whereas there appears to be a high level of interest in interdisciplinarity and sustainability research, the same cannot be said in areas of teaching and learning.

O'Donoghue *et al.* (2018) emphasise that as a learning process and approach, ESE thrives on learner-centred, learning-led curriculum engagements to help learners develop understanding of concepts, their surroundings and practices. The findings revealed that institution leaders observed that much mediation takes place in ways they consider not to be supportive of effective ESE mediation. The responses that follow capture the thoughts lecturers and PSTs had towards the mediation of ESE during the training of PSTs.

Both the lecturers and PSTs supported the assertion that ESE mediation is taking place to a certain extent. During the interviews, the lecturers shared the following on ESE mediation. The first lecturer (T1) admitted, *'The current content material does not adequately prepare pre-service teachers to learn and teach for sustainability. There is over compartmentalisation, heavy subject insulation, no integration and subjects are too specialised. The infusion process is not strong enough so far. It is not working well. Brushing over does not work.'* (T1)

This submission points to the frustration that lecturers may be encountering not only in ESE mediation, but in all subject areas where interdisciplinary approaches are known to improve teaching.

Another lecturer emphasised, *'A lot is taught theoretically with less emphasis on practical activities. We don't have technology for virtual practical activities. Also, I have never used content material to explicitly address environmental and sustainability education matters. We just brush on the concepts. The practical aspects that would help them to retain the knowledge are not included. The tendency to rush through to complete the course outline prevails.'* (T4) What lecturer T4 shared was similar to what lecturer T1 pointed out and in both cases, the focus is not on practical activities. The effort to effectively mediate ESE requires effective pedagogy to ensure a participatory teaching and learning method that is properly incorporated into curriculum practices, pedagogy, extracurricular and campus-based activities to the effect that pressure is being exerted on traditional modes of delivering educational services in HEIs due to a rising demand for interdisciplinarity within the efforts to mediate sustainability issues (Blake *et al.,* 2013; Reza, 2016).

Noteworthy, is that one of the lecturers interviewed acknowledged that there was a limited degree of ESE engagement. She said, *'Somehow the content in my course outline incorporates preparing prepare pre-service teachers to learn and teach for sustainability but not directly, not explicitly but somehow you do talk about it. Interdepartmental collaboration among lecturers is lacking. I have used it explicitly in the school organisation management course that deals with the 9 pillars in relation to schools as centres of care and support.'* (T2) The statements by lecturer T2 confirm what Lotz-Sisitka, Wals, Kronlid and McGarry (2015) pointed out that quality ESE mediation demands methods that not only encourage students and teachers to respond to the surrounding society but also to educational processes of learning. The advice by Lotz-Sisitka *et al.* (2015) that dominant pedagogies and forms of learning that presently characterise HE need to be reconsidered for the good of the leaders, is useful to this study when I consider the responses from participants on the quality of ESE mediated.

Evidently, the lecturers had varied experiences on how they found ESE mediation as they prepared PSTs to teach and integrate ESE into their curriculum planning and teaching practices. Lecturer T2 stated, *'I have used content material … in the school organisation management course to address environmental and sustainability education matters. The content of my course outline is still at the introductory stage…*

The debate is on whether to integrate by infusion or to have a separate independent educational module.' She focused on the debate about the best way to integrate ESE and was in a way referring to policies and guidelines that need to be put in place.

Finnveden *et al.* (2020), quoting a section of the Swedish Higher Education Act which in part recommends HEIs to promote sustainable development in the course of their operations, are in effect reminding us of the crucial role policies play during implementation phases that for this study would include guidelines on how best PSTs could be prepared for teaching and integrating ESE into their curriculum planning and teaching practices. These authors further note that ESD in HEIs is intended to encourage young individuals to become active participants in building more sustainable societies. It is here that the quality of ESE mediation counts since the dominance of lecturing theory content – characterised by the accumulation of head knowledge with practical activities lacking – cannot easily translate into transformative ESD.

The fifth lecturer focused on the need to act in unity when he said, *'The practice of managing change in relation to integrating environmental and sustainability education is isolated in practice and it is also individualised. We can do much more than we are doing now.'* (T5) His comments are supported by Blake *et al.* (2013) who point out that many institutions recognise policies and programmes that promote an interdisciplinary approach to sustainability but encounter a lack of support for cross-boundary integrative approaches and participatory pedagogies. The three authors add that institutions are often influenced by discipline-based HEI structures and methods that are characterised by thick subject insulations suggesting that only educational establishments 'thinking outside the box' can be able to work across subject boundaries more easily. Blake *et al.* (2013) also emphasise that survival and flourishing of interdisciplinary programmes is more often than not dependent on support from institutional leaders.

The lecturers' responses confirm that there is much transmission of information and little transaction of learning that O'Donoghue *et al.* (2018) point to as being responsible for promoting co-creation of knowledge, a key factor in ESE mediation. Shumba and Kampamba 2013 also encourage using alternative teaching and learning strategies that result in the development of SCs.

On their part, PSTs stated that they, to some extent, participated in some form of ESE mediation not only as students but also as teachers dealing with primary school learners. The findings show that on the one hand, there were students that felt they had been taught ESE well, while on the other there were those who believed they had been exposed to very few ESE engagements. Participant S3 said, *'The 2030 UNGA was mentioned as a by-the-way during Geography lessons. The story on Climate Change – Global Warming, that one we did…I think that as a pre-service teacher I have been taught and prepared well enough. There was some teaching on content relating to ESE. It's only the practical part that we didn't do. Am well versed with the theory part.'*

Participant S1 shared his experience in the teaching field, *'I find myself using the surrounding areas because the learners need to be exposed to their natural environment. You need to teach learners things that are around them within that school or that environment.'*

It is evident from the majority of participants that they predominantly got head knowledge experiences which lacked practical activities since most were conducted in form of lectures. This contrasted with constructivist classroom settings (*cf.* 3.2.1.1) which were presented by many authors as one of the best forms of ESE mediation (*cf.* 2.6.1)

In summary, the different ESE mediation experiences mentioned shed light on the preparation of PSTs for teaching and integrating ESE into their curriculum planning and teaching practices. The next section discusses the importance of utilising online educational platform services through the lenses of participants that took part in this study.

Category two: Utilisation of online educational platform services

The use of online educational technology platforms to realise meaningful ESE mediation experiences was seen by most lecturers as being problematic. None of them considered it a viable preferred option even though one lecturer emphasised the need to adapt to better educational services when he said, *'We all need to adapt – from managerial level to students' level as consumers of educational services. The need to use up-to-date materials.'* (T5)

All the lecturers pointed out that PSTs were reluctant to make use of online services because such a mode required personal commitment and adequate financial support. Lecturer T5 said, *'Online mediated learning has challenges such as internet network. Some of the first-year learners have never touched a computer. If the resources were there, I think it's a good way of learning…the teaching and learning through the e-Learning is much more convenient for the learners because they don't have to waste some other resources coming for their classes here.'*

Another lecturer lamented, *'Issues of connectivity prevail. Connecting other platforms such as Zoom, WhatsApp, Google Classroom etc. has not been possible.'* (T2) Still, a further focus on the inadequacy of online platforms was highlighted by another lecturer's explanation, *'This mode is not very adequate in delivering meaningful learning to students. Online may be offering good learning platforms because of individualised learning spaces…those who are committed are doing well… especially research-based inquiry inclined learning.'* (T3)

Noteworthy is that the views shared by the three lecturers above differ from the findings of Pretorius *et al.* (2019) who, in their research undertaken at UNISA found that ODeL blended with printed materials in form of blogs, e-forums and text messages offered students effective and successful teaching and learning opportunities. It should be remembered that ODeL at UNISA has over the years been updated to a high standard given the fact that since 1946, UNISA has been offering distance learning (UNISA, 2020). As such, their settings may not be comparable to the two younger HEIs that took part in this study. Institution TA was established in 2010 as a university and Institution TE in 1962 (Eswatini Government, 2021).

Moreover, Woo *et al.* (2012) found that the curriculum model that used online communication facilities and techniques to figure out the solutions to environmental issues at hand, brought about transformation among those who used such a model. Those who made use of the curriculum model which relied on online communication facilities and techniques showed that they had developed participatory and constructive processes in their curriculum practices. There was integration of ideas in a transdisciplinary setting that led to increased depths of understanding among participants, a clear demonstration that technology supported student-centred and student-led experiences characteristic of ESE.

It therefore remains a challenge to consider using online educational platform services in settings that may not be consistently reliable. Accordingly, such online educational services would lack elements of constructivist teaching and learning especially appropriate learning conditions (*cf*. Figure 3.3).

Category three: Use of physical structures and grounds

According to three of the six lecturers interviewed, the physical structures and grounds available offered limited use as spaces for learning because most of them were not accessible and in almost all cases, PSTs were taught theoretically with very little emphasis on practical activities. One lecturer, reflecting on the limitation of using physical structures and grounds lamented, *'I have not used physical structures at tertiary level even though I used them at high school level. A lot is taught theoretically with less emphasis on practical activities. We don't have technology for virtual practical activities.'* (T4)

Another lecturer was explicit about the lack of hands-on approaches during ESE mediation when he said, *'I wouldn't say I have considered using physical structures and surrounding areas as a medium for pre-service teachers engaging in environmental and sustainability education activities, but we have done it at primary and high school levels. As we go higher, it becomes harder. We have separated living and learning. Now we just talk about planting trees without planting any trees.'* (T5)

In yet another interview another lecturer agonised, *'…the physical structures and surrounding areas as a medium for pre-service teachers engaging in environmental and sustainability education activities? A few years ago, all those indigenous trees were cut down and were replaced by concrete decorations. Taking away those trees was depriving… and I haven't recovered from that.'* (T3)

It was evident from lecturers' responses during the interviews that physical structures and grounds did not contribute to the integration of ESE into PST curriculum practices as they were being prepared for teaching and integrating ESE into their curriculum planning and teaching practices. This is in contrast to Shiel *et al.* (2020) who found that at BU, they had used their grounds to reinvigorate their ESD curriculum agenda in an attempt to integrate sustainability into their curriculum practices (*cf.* 2.5.2).

It is noteworthy that at the time of collecting data for this study, the concept of using grounds as Living Laboratories was becoming established at institution TA. As part of my field observation to collect data regarding practices by TTis, I found that a small portion of the grounds at institution TA had been turned into a Living Laboratory (*cf.* Appendix L, Photograph 4). This is in line with what was noted by Wirth *et al.* (2019), Purcell *et al.* (2019), Leeds Living Lab, (2018) and Shiel *et al.* (2020) who emphasised that HEIs act as Living Laboratories where sustainability experiences become aspirational and intentional undertakings in learning and research (*cf.* 2.6.2).

Zen, D'souza, Ismail and Arsat (2019) further explain that Living Learning Labs are presented as integrative approaches capable of bringing about transformation through co-creation for sustainability. They considered this a positive way of responding to contemporary global environmental challenges which in part represent the implementation of sustainability. The Living Labs concept – that facilitates on-the-ground practical experiences – would be the answer to student S3 who pointed out the absence of practical activities beyond the theory they were taught. This study exposed a gap in the utilisation of physical structures and grounds as teaching and learning tools. In considering the use of grounds, we are reminded by Kornelaki, Plakitsi, Kolios, and Maidou (2019) that sustainability is demonstrated by having activities that are economically sound, socially just and economically viable and humane – activities that can thrive in physical structures and grounds of TTIs. These are the same grounds that Rogan and Grayson (2003) referred to in their Theory of Curriculum Implementation (*cf.* 3.2.3) when they emphasised the need for appropriate contextual settings to support curriculum implementation. Most participants regretted that such physical environments, though present, were not being utilised for teaching and learning purposes.

Category four: Observed transformation of PSTs

The role of education to improve humankind is – in the words of McGrath (2019) – appropriate priority that we should utilise as a transformative tool so that people are equipped with what Bokova (2014) lists as values, skills and knowledge of sustainability in our lived contexts. I consider it possible to create such transformative learning experiences for PSTs in our TTIs (*cf.* 1.1).

Four lecturers whom I interviewed noted transformation resulting from teaching and learning experiences with two emphasising that teaching practice experiences were good transforming sites. Each separately stated, *'I have observed changes in behavioural patterns among pre-service teachers that occurred after teaching practice.'* (T3 and T5)

Another lecturer noted that PSTs transformation was hard to assess while another pointed out that focusing on the Affective Domain helped to promote participatory learning which in turn fostered transformation. She said, *'Yes, there is transformation as we teach focusing on the Affective Domain.'* (T2)

One of the lecturers who focused on using participatory learning explained, *'Changes in behavioural patterns have been observed among pre-service teachers during teaching practice where I like to promote participatory learning.'* (T3)

According to O'Donoghue *et al.* (2018), ESE engagements are progressive and transformative pedagogical approaches meant to develop students' critical thinking, participatory decision-making, value-guided learning and multi-method approaches that lead to the development of a learner who has the capacity to act for sustainability (UNESCO, 2017a) (*cf.* 2.6.1).

The need to engage in transformative ESE teaching is echoed by Shumba and Kampamba (2013) (*cf.* 3.2.1.4) and this need is closely linked to the Living Laboratory concept promoted by among others, Purcell *et al.* (2019) (*cf.* 2.6.2.). Lecturer (T2) talked of focusing on the affective Domain, an aspect of learning also recommended by Wamsler (2020) when he stated that transformative approaches had the potential to promote mindfulness that in ESE mediation is important for the realisation of among others, learning objectives in behavioural domains (*cf.* 2.6.2.).

Lecturers (T3) and (T5) emphasised transformation during teaching practice when they pointed out that during this part of their curriculum practice, PSTs develop competences that are capable of changing them as individuals and in turn change their teaching and learning in such a way that their classroom experiences become action-oriented, interactive and learner-centred. Preparing PSTs to learn and teach for sustainability means preparing them for a transformative experience as they progressively develop SCs.

Similarly, Avery and Nordén (2017) point out that spaces for collaboration should be identified in locally contextualised practices to ensure that academic knowledge is made relevant in real life situations. Teaching practice, as mentioned by lecturers (T3) and (T1), constitute what Avery and Nordén (2017) refer to as enabling mechanisms for effective transformation through sustainability engagements (*cf.* 2.4.2, 3.2.1 and 3.2.1.5).

The positive effects of teaching practice highlighted by both lecturers and PSTs suggest elements of constructivist teaching and learning considered appropriate for effective ESE mediation (*cf.* 3.2.1.4).

In summary, the theme on ESE mediation experiences as manifestations of teaching and learning that is grounded on the ideas and principles that underlie sustainability, are in effect the combined effect of Education, Sustainability and the Environment on the process of curriculum integration that the four categories revealed. The next section discusses the interfacing of the 2030 UNGA with the preparation of PSTs for teaching and integrating ESE into their curriculum planning and teaching practices.

Theme two: Interfacing SDG 04, targets 4.7 and 4c with TTI curriculum practices

The three categories that gave rise to the theme of interfacing SDG 04 with TTI curriculum practices are: individual possession of knowledge on SDGs, communicating SDGs with PSTs and policies and agency for SDG integration. Three institution leaders, six lecturers, four PSTs and two officials, one from organisation G1 and the other from organisation G2 not only pointed out that the knowledge on SDG matters was present in limited quantities, but also that SDG integration in functions, operations and practices was not enough. They all saw policies as having a limited impact within the strategic plannings of institutions. The three categories are discussed in the subsequent headings.

Category one: Individual possession of knowledge on SDGs

The lack of adequate SDG knowledge was expressed by one lecturer, *'In general, I understand the SDGs but at the same time, I have question marks on some of the goals that they are pushing.'* (T5) Lecturer T5 was alluding to the tensions that exist when what should be included in a curriculum is not explicitly presented. This finding

is supported by Reza (2016) who advised that in order to effectively integrate SDGs, a suitable and effective pedagogy should be put in place.

Another lecturer noted, *'Many lecturers lack the basic sustainability knowledge such as the ability to unpack SDGs. Many are disconnected from the SDG discourse and climate change issues. They do not connect the social, political aspects that predetermine the quality and standard of life.'* (T3)

Noteworthy, is the confession by another lecturer, *'I am not conversant and hence lack details of SDGs. I have not communicated Sustainable Development Goals with pre-service teachers.'* (T3) Yet, lecturers as agents for curriculum implementation, are expected to empower PSTs for the proper implementation of SDGs – a fact shared by Albareda-Tiana *et al.* (2018) who point out that empowering young people must be a priority if SDGs are to be properly implemented in HEIs. They emphasise that it is of great advantage for PSTs who are seen as powerful change agents, to acquire competences in sustainability using holistic approaches mentioned by Lotz-Sisitka and Hlengwa (2015) (*cf*. 1.2 and 2.7.2).

Lecturers (T1), (T3) and (T5) highlighted a lack of adequate SDG knowledge among fellow lecturers with two out of the three admitting that they personally felt they could not adequately handle SDGs. Yet Troschke (2015) and Ates and Gül (2018) refer to HEIs as epistemic communities that are uniquely positioned to facilitate the integration of SDGs in their curriculum systems as well as the local communities they serve (*cf*. 2.4.1 and 2.5.1)

The proper implementation of all the 17 SDGs hinges on the quality of organisational governance, culture and operations of HEIs. A whole-university approach involves mapping what is already being done; establishing internal capacity to promote SDG ownership; identifying priorities, opportunities and gaps; integrating, implementing and embedding the SDGs in university strategies, policies and plans to monitor, evaluate and communicate their actions (SDSN, 2017). This, according to the lecturers is lacking.

The High-level Political Forum on Sustainable Development (HLPFSD) report of 2018 revealed that not much has been done in the area of research, and further stated that the biggest institutional challenge to engaging with SDGs was lack of staff capacity,

resources, and a framework to operationalise and to integrate SDGs into their existing programmes (HLPFSD, 2018).

The tackling of complex environmental, economic and social issues using evidence-based solutions, as suggested by Trencher *et al.* 2016), cannot be handled well by lecturers who confess lacking the necessary knowledge on SDGs (*cf.* 2.5.1).

The learning experiences of PSTs and upscaling the quality of trained teachers referred to in the target 4c of SDG 4 were investigated and the PSTs shared their opinions. The first PST said, *'I've heard about SDGs in Sociology of Education where we were introduced to SDGs. They also included it in the exams, we answered some of the questions. SDGs are so important especially the way the teacher introduced them to us.'* (S3)

The second PST presented a picture different from the first one, *'SDGs were not discussed that much in lecture room experiences where Environment, Sustainability or Sustainable Development Goals were mentioned.'* (S4)

The third student – similar to lecturer T3 – expressed total ignorance about SDGs when he said, *'I have not heard about SDGs and even COP 26 related issues. I don't know anything.'* (S1)

Considering the contribution by PSTs, two of whom expressed their lack of knowledge even as one of them revealed that she had been taught SDGs during a Sociology of Education lesson, these findings reveal a lack of SDG exposure among not just PSTs, but also lecturers.

Mulá *et al.* (2017) point out that if we are to realise the SDGs in an effort to transform humankind and save our planet, building the understanding of PSTs in the areas of ESE to empower them as change agents should be prioritised as educators proactively search for opportunities to transform HEIs' curriculum policies and practices (*cf.* 2.5.1) These are the policies and practices official (O1) was referring to when he said, *'My organisation tried to influence the institutions of higher learning in order to introduce issues of sustainability and the environment to impart that knowledge to lecturers who would in turn pass it on to their students whose influence beyond the classroom is big. The seeds were sown but our influence on the infusion of target 4.7 and 4c of SDG 4 need to be investigated.'* (O1)

Participant (O1) was indicating that it is very important to expose lecturers and PSTs to SDGs and he is in agreement with Filho *et al.* (2017) who emphasised that attaining SDGs will require HEIs to assume a leading role through research and redirecting the construction of knowledge through the lenses of the 2030 UNGA (*cf*. 2.5.2). This is partly what communicating SDGs with PSTs is about and is discussed in the next section.

Category Two: Communicating SDGs with PSTs

Not only was there a lack of adequate SDG knowledge by lecturers and PSTs, but there was also lack of practically lived SDG-based experiences. Moreover, there was limited SDG integration into functions, operations and practices that were in part characterised by a lack of explicit communication of SDG content. The participants presented a variety of responses. One institution leader said, *'It just can't be head knowledge. So, head knowledge and practical experience is the best…and is best incorporated into our programmes by first transforming the lecturers before we even get to the students. The SDGs are something that we all strive towards and it is always quoted in what everybody does.'* (L2) It is worth noting that the institution leader L2 did not state whether or not SDGs had been communicated at the institution that she leads. She nevertheless pointed out the need to have practical experiences with the much talked about SDGs.

It was evident that lecturers felt the communication of SDGs they had carried out with PSTs was inadequate. One lecturer noted, *'For now, incorporating Sustainable Development Goals in their functions and operations beyond class activities is lacking.'* (T2) Another lecturer clarified, *'SDGs have been communicated and SDG matter is part of the modules being taught. There is a lot of ESE-ESD in the curriculum, but it is not explicitly expressed.'* (T4)

The only student who explained how SDGs were communicated confirmed what lecturers had also shared by saying, '*SDGs teaching was affected negatively. I think the SDGs were absorbed into some of the topics, for example, in Geography and science. Now when I compare it, I think they covered everything. They were infused but not mentioned directly…. It's only the practical part that we didn't do. Am well versed with the theory part.*' (S3)

While the student was sympathetic in her views and attributed the lack of SDG communication to factors relating to lesson disruptions, both lecturers – without suggesting any reason – stated that the incorporation of SDGs in the TTI curriculum practices had not been fully implemented. Their responses support Kioupi and Voulvoulis' (2019) suggestion that SDGs should be reconstituted to produce appropriate pedagogies and learning strategies. Yet, Farinha, Azeiteiro and Caeiro, (2018) who sought to determine how sustainability had been integrated into the policies and strategies of HEIs within the UNGA, not only found that HEIs were not committed to ESD implementation, but also that there were few policies linked to SD matters.

The 2030 UNGA in effect provides humankind with fresh impetus to scale up the implementation of ESD so that learners at all educational levels are enabled to acquire the knowledge and skills needed to promote sustainable living. The 2030 UNGA is hence emphasized to reveal where ESE and targets 4.7 and 4c of SDG 4 should interface to position PSTs as functioning members of the SDG community of practice showcasing EMoET as potential SDG keepers (UNESCO, 2018a).

Overall, the picture presented is that exposure to SDGs is not uniform for all PSTs. This position is in line with Aleixo *et al.* (2020) who found that natural and environmental sciences as well as social sciences and humanities were the courses mostly addressing SDGs (*cf.* 2.5.2). Additionally, only a small number of courses were seen to have integrated SDGs in a non-explicit way. The findings from lecturers and PSTs point to policies and agency discussed in the next section.

Category Three: Policies and Agency for SDG integration

Policies and agency for SDG integration were seen by many participants as lacking SDG inclusions in the strategic planning frameworks of institutions. This observation was based on what was seen as a lack of aligning institutional programmes with SDGs, a lack of explicit reference to SDGs and a lack of policies that promote agency. All 14 interviewed participants stressed the absence of policy guidelines and a form of agency that lacked impact. The first leader interviewed declared, *'Yes, there is a systemic commitment within the university's strategic planning to strengthen the integration of Environmental and Sustainability Education in her present and future curriculum practices.'* (L1) It is such a form of commitment that aligns institutional

programmes with SDGs. The second leader interviewed noted the lack of implementation and lamented, *'…it is wonderfully written down on paper but it's the implementation that is far lacking.'* (L2) The third leader was more optimistic and insisted that SDGs could get integrated. She said, '*I think the 2030 SDG agenda can gain ground if we integrate it into our strategic plan. The main focus here is that we integrate – whichever way we do it.*' (L3)

As leaders, participants L1, L2 and L3 spoke from informed positions as they emphasised the fact that the commitment to SDG integration lacks adequate implementation strategies in the respective institutions that they lead. Their views reveal the hope they share that SDGs can indeed form part of TTI curriculum practices once they are properly infused in policies. The need for guidelines is highlighted in a UNESCO document where it is pointed out that guidelines underpinned by reliable research data are required to help tailor workable approaches of global standards. The main areas of contribution include providing students with knowledge, skills and motivation to understand and address SDGs (UNESCO, 2017a).

The officer from organisation G1 clarified, *'The seeds were sown but our influence on the infusion of target 4.7 and 4c of SDG 4 needs to be investigated. When we look at my faculty as an example, a few people have tried to implement out proposals. Maybe only 20% of the lecturers have done something about it. Only those in the environmental science department. For the others, I don't know'*. (O1)

The second officer from EEA pointed out, *'As of now, as countries, we need to mainstream our programmes and to align them to the SDGs Agenda so what am observing is that the work that we do sometimes we do not link it to the SDGs. It's only at the time of reporting that we start looking for the connections – that 'this activity or that activity is aligned to SDGs'.'* (O2)

The two officials – not directly linked to teaching PSTs – expressed their concerns about integrating SDGs into HEIs curriculum practices and emphasised the need to mainstream our programmes so that they are aligned to the SDG Agenda. Participant (O2) pointed out that the superficial handling of SDGs for the purpose of record keeping was not good, reminding us again of the unique position enjoyed by HEIs that Troschke (2015) and Ates and Gül (2018) refer to as epistemic communities that have

been uniquely positioned to facilitate the integration of SDGs into their curriculum systems as well as the local communities they serve (*cf.* 2.5.1).

The findings presented by lecturers about policies, practices and agency were all identical as seen from the views they shared. The first one's regret was, *'To a very little extent, Teacher Training Institutions' educators have not succeeded as change agents to deliver educational services that promote achieving Sustainable Development Goals.'* (T5) The second lecturer agreed with participant T5 and added, *'Our policy documents do not have explicit reference to environmental and sustainability education. We are not incorporating SDGs in our functions and operations beyond the little that is taking place in the classroom.'* (T4) Moreover, the third lecturer indicated the lack of agency by stating, *'My view is that we still have to do more. There is still a long way to go. For now, incorporate Sustainable Development Goals in their functions and operations beyond class activities is lacking.'* (T2) The fourth lecturer lamented, *'There is nothing much to write about with respect to Policies, Practices and Agency. Policies of SDG and sustainability should be intentionally suggested hence almost to no extent have teacher training institutions succeeded as change agents to deliver educational services that promote achieving SDGs. We need to facilitate, guide and direct teacher training institutions into SDG arenas – working with them in learning led activities at class and club levels.'* (T6)

The responses by the four lecturers all point to the fact that policies to guide the incorporation of SDGs are lacking and there is not much communication on SDG matters, partly because policies influence practices and the impact of agency. Filho *et al.* (2017) (*cf.* 2.5.2) advise that attaining SDGs will require HEIs to assume a leading role through research and redirecting the construction of knowledge through the lenses of the 2030 UNGA. Also, Filho *et al.* (2019) (*cf.* 2.5.1) add that many HEIs were still at infancy level with regard to SDG implementation, suggesting that HEIs needed to engage in practice-oriented-applied-research that integrates SDG issues with other sustainability challenges.

Therefore, the lack of adequate SDG knowledge explicitly expressed by PSTs and their lecturers coupled with the lack of practically lived SDG experiences point to the fact that there is a lack of integration. Bernstein (1990) speaks of shared meanings and practices (*cf.* 3.2.2), yet the quotes from participants pointed to a lack of integration

of content linked to SDGs. It therefore appeared that there was thick subject boundary insulation that potentially negatively impacts the construction of learning which includes SDG 4, targets 4.7 and 4c (*cf.* 3.2.1).

Theme three: Support for effective ESE integration into TTI curriculum practices

The theme, support for effective ESE integration into TTI curriculum practices emerged from categories that were identified as elements of ESE integration considered to be underpinnings for meaningful ESE integration into TTI curriculum practices. The categories discussed in the texts that follow – out of which theme three of this study emerged – are: capacitating human resource, promoting, participation and ownership, creating a standalone ESE subject and utilising IK for effective ESE integration.

Category one: Capacitating Human Resource

The need for support to efficiently integrate ESE into TTI curriculum practices was pointed out by institution leaders and lecturers who not only recommended human resource capacitation as a form of empowerment, but also pointed out that there was a need for visible implementation based on scientific research. They also pointed out that cooperation and adequate financial support would be needed. Data collected from interviews administered to institution leaders pointed to the value of empowering people in order to attain effective ESE implementation. The responses that follow capture the thoughts the leaders had towards human resource capacitation.

Concerning available programmes, the first leader interviewed explained, *'In terms of academics, I have encouraged them to reinstitute programmes that are directly related to sensitising our communities about ensuring that the environment is taken care of. The curriculum that we have presently for our pre-service primary school teachers as we review it, we must have topics on the environment.'* (L1) The second leader felt that everyone had a role to play and suggested, *'Everybody would have to kind of be on board. Yes, lecturers but even the administration should bless the campaign and be ready to support it. That's the kind of way you really get things done if you have the support of the leadership.'* (L2) The third leader in her submissions suggested that improving the performance of TTIs to support the process of preparing PSTs for teaching and integrating ESE into their curriculum planning and teaching practices

would require establishing workable partnerships. She said, *'Key enhancers to the development of pro-environmental attitudes and behaviours among pre-service teachers involves creating awareness, then you capacitate. Lecturers are taking ownership given the way they are handling their Change Projects and that is capacitation. Students want to be part of any planning process that involves them. They want to be engaged from commencement of a planning stage if you don't want them to resist.'* (L3)

Capacity building was further supported by the official from organisation G1 who reminded us that education systems are complex organisations that function with much input from outside educational structures and emphasised that organisation G1 has the potential to contribute to meaningful ESE integration. He said, *'Through awareness and capacity building awareness campaigns, we need to team up with municipalities. One of the initiatives that I have seen them coming up with is the introduction of environmental talks at the pre-primary, primary and high schools within their jurisdiction.'* (O1)

In order to effectively support ESE integration, the process of capacitation requires protagonists who are well trained in all aspects of learning as Dlouhá *et al.* (2019) pointed out when they advised that competences which address the cognitive, socio-emotional and behavioural domains of learning in a balanced way should be promoted (*cf.* 2.7.1). Such a promotion requires the establishment of policies. It is encouraging to note that institution leaders were concerned about policies that governed ESE integration. The first leader indicated, *'Although there are no specific policies relating to environmental education, we have a policy ensuring that the curriculum is reviewed at specific times. As we review our policy, we align them to the SDGs so that we are also sensitized to ensuring our environmental sustainability as contained in the 2030 Agenda. Yes, there is a systemic commitment within the university's strategic planning to strengthen the integration of Environmental and Sustainability Education in her present and future curriculum practices.'* (L1) The second leader in agreement with participant L1 said, '*We don't have any policies…guiding the integration of Environmental and Sustainability Education into curriculum practices of this Teacher Training Institution. Practically, we haven't made significant adjustments to accommodate the 2030 United Nations Global Agenda as a deliberate step to achieve*

Sustainable Development Goals except maybe on paper, a drop of it in the 2015-2020 strategic plan. Nothing has been implemented.' (L2)

From the comments of participants L1 and L2, it is clear that both institutions – TA and TE – which formed part of this study lack policies to address ESE matters in specific ways. Sarıkaya and Saraç (2018) noted that establishing how PSTs integrate ESE into their curriculum implementation practices in the classroom partly depends on how they develop SCs rooted in experience and action (*cf.* 2.8.1). Experience and action cannot be established without clear policy guidelines. Continuous professional development can best be realised when policies explicitly address the integration process. Carl (2010) points out that the process of integrating ESE into HEIs should be a representation of the expressions of what ought to be experienced in the teaching and learning processes (*cf.* 1.4.1.2).

Lecturer T4 considered having proper institutional policies as a very important integration enabler for they have the potential to support the implementation process. She stated, '*The…university curriculum designers should influence the institution policy for effective Curriculum Implementation; that is, the curriculum development committee. Additionally, the university has tried to factor in sustainability and even our physical environment – the grounds reflect that we are consciously doing something. Integration enablers should include lecturers receiving training for the module and to collaborate.*'
This point was further supported by the official at EEA who said, '*The National Environment Fund is trying to respond by engaging communities that want to do climate change adaptation where we provide financial assistance. Furthermore, we engaged in campaigns to reduce and eliminate the use of single-use plastics. We even have a project labelled 'Waste Management for Improved Livelihood'. Moreover, we are also supporting individuals with green initiatives who are piloting green projects.*' (O2)

My interpretation of engaging communities as pointed out by participant O2 is that communities of practice in TTIs should be made aware of such support. As we progress into the second decade of the 21st century, there is renewed interest in sustainability matters. Writers such as Johnston (2009) speak of integrating transformative sustainability curriculum initiatives as an attempt to step outside

curriculum spaces (*cf*. 2.8.1). She focuses on curriculum alignment that participant O2 referred to when she insisted on the need to underpin our ESE activities with research findings.

The following statement from participant O2 supported the need to be informed by research if we are to effectively integrate ESE into our curriculum practices. She said, *'We need more research, data and visibility to do education and awareness in order to present people with tangible proof of whatever we are claiming is happening. The lack of data makes it sound like we are just telling a tale. The story on micro-plastic particles needs to be substantiated with scientific data as evidence to back up claims on cause and effect. There is need to expose that knowledge.'* Additionally, participant O2 acknowledged the support that government structures had promised when she stated, *With education, we have adequate cooperation from the Ministry of Education. All we need to do is direct resources. We need consistency which can be realized with adequate financial support.'*

According to Trencher *et al.* (2016), Bhowmik *et al.* (2018) and El-Jardali et al. (2018) (*cf*. 2.5.1), part of HEIs capacity building for students includes supporting research efforts so that evidence-based solutions, pathways and innovations are made available to underpin the implementation of SDGs through traditional disciplinary settings as well as interdisciplinary and trans-disciplinary alternatives.

Participant O2 was convinced that outside support from organisation G1 and organisation G2 would be key to realising meaningful ESE integration when she said, *'We need to...add guest lecture programmes for them to come and discuss topical issues…. Interactive activities with Eswatini Environment Authority officers visiting to interact with scholars to engage in discussions and participate in commemoration of green day events. One of our key areas and functions is education awareness and providing information to the public.'*

The preceding comment by participant O2 connects well with observations made by Sánchez et al. (s.a) when they suggest that the implementation of sustainability can be realised if we focus on supporting environmental literacy, developing the curriculum, increasing research engagement – all carried out in partnership with government, non-governmental organisations and other key stakeholders (*cf*. 2.8.1).

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Concerning cooperation and support of the community of practice, three of the participating lecturers shared their views with the first one asserting that *'sustained transformative teaching and learning depends on the availability of resources – a limiting factor is financial resources. We have adequate human resource.'* (T4) Participant T4 was reflecting on the same type of resource that the leader of institution TE was referring to earlier in this section when she pointed out the need for partnerships among all stakeholders. Furthermore, participant T4 suggested, *'Agency in their local communities using project-based learning approaches is one way students can get institutional support to participate as active change agents.'* Participant T5 was thinking of creating solutions with long-term commitments when he said*, 'am thinking of strategic planning. An institution like this one, maybe after 3 years, it should…draft a strategic plan, and if sustainable development is one of the pillars of that plan, then I think this could be a success.'*

The lack of adequate policies to promote ESE integration in an effective and sustainable way was a focal point for participant T3 when he pointed out, *'The policies, practices and agency are directly dependent on lecturers' ability to create sustainability education content material. However, the policies that promote sustainability agency are not adequate.'*

All the participants are pointing to the fact that support for effective ESE integration in TTIs through human resource capacitation cannot take place effortlessly. As pointed out by Bernstein (1990), relevant content material that is introduced in curriculum structures should yield interconnections characterised by common concepts, values and skills (*cf*. 1.4.1.2). It is such interconnections that promote participation and ownership discussed in the next section.

Category two: Promoting participation and ownership of ESE integration

Promoting participation and ownership of ESE integration is part of capacity building mentioned in Theme three, Category two. With it comes promoting a sense of belonging which according to Damarsasi (2021), helps to give purpose and a sense of contribution.

Lecturers pointed out that promotion, participation and ownership characterised by involving stakeholders in decision making processes was critical in the quest for ESE

integration. Concerning interconnections that promote participation and ownership, one lecturer pointed out, '…*a need to engage pre-service teachers in workshops and green movement initiatives using the participatory approach to own what they do.'* (T1) She further indicated, *'We are not collaborating adequately. The thick department boundaries hamper integration. It is true that collaboration complements integration and interdepartmental cooperation would operate well even after creating a separate module.'* Lecturer T4 suggested, *'Resistance to a new mode of integrating can be reduced by engaging everyone in the academic and support staff.'* This recommendation is supported by Darmasasi (2021) who advised that for a process to succeed, it should be understood, adopted and appreciated by the beneficiaries.

Noteworthy is that students are seen as potential change agents as suggested by Lecturer T1, *'Students are change agents. Empower them through approaches that promote participation and ownership which equates to transformative teaching. Transform them as they learn. What are we preaching? We are not preaching anything in terms of sustainability! However, on the ground our practices are speaking loud, for example, the clean green grounds. Our compound is a big story. We plant trees, have a forest and we practice effective rubbish collection. Such observed practices are demonstrating sustainability life styles.'*

Ates and Gül (2018) suggest that as change agents, teacher educators should introduce new ideas in their teacher education practices, building the understanding of PSTs as change agents in the area of ESE implementation (*cf*. 2.5.1). The need to have a broad support base is highlighted by lecturer T1 who stated, *'The enablers as pillars to support the module entail involvement and engagement of the curriculum centre, examination council, Eswatini Ministry of Education and Training and Eswatini Environment Authority as key external players. Conservation bodies would contribute.'*

Promoting participation and ownership of curriculum initiatives is in line with constructivist principles and these appear to be supported by TTI leaders and lecturers (*cf*. 3.2.1 and Figure 3.3). Interdepartmental collaboration to blur subject boundaries as seen through Bernstein's concept of classification is an attempt to integrate curriculum practices (*cf*. 3.2.2.1), a practice supported by many authors (*cf*. 1.1).

The combined effect would then help to realise the mode of integration – discussed in the next section and – considered by all participants in this study as the best form of ESE integration, a standalone ESE teaching and learning space.

Category three: Creating a standalone ESE Subject

As a researcher immersed in the data collection process, I am aware – through experience at the education institution where I work – that curriculum engagements are often resisted without any specific reasons. However, in this study, it emerged that all 14 participants interviewed favoured a module in form of a standalone ESE subject. Two institution leaders shared their views with the first saying, *'For us when you integrate, it must involve everyone, whether it is support staff or academic so that we can have different programmes…. That programme is a course, a standalone including all subjects to ensure that everyone is involved in this. We are using an integrated approach to teach ESD. We are integrating using the integrating approach. We are designing an ESD course that will be a full course that focuses on both theory and practicals.'* (L3)

In the same vein, leader L2 said, *'We've got a chance, drawing up new programmes so it's a good time now to start. It can make us to stand apart from other people. The challenge is on our side to craft it in such a way that it hits a note with the policy makers at national level as well as scaling it up to our B.Ed. programme that is, the Global Agenda to be part of the B.Ed. curriculum. This could be carried through all the subjects, but it could also be a completely standalone programme beyond the status of a module.'*
The leaders' expressions blend well with Johnston (2009) who observes that the curriculum in its current state is too slow in its operatives and, as such, incapable of preparing learners quickly enough in a rapidly changing world (*cf*. 2.8.1).

Regarding the standalone module, both officials interviewed – one from organisation G1 and the other from organisation G2 – supported the idea of a standalone ESE module. Official O1 said, *'The best way to integrate ESE? Infusion is the route we are is taking. Infuse it in the different courses but in my faculty, the course Sustainable Development was introduced in only one programme that deals with environmental management and water resources. It is a standalone module or course.'* The second

official not only supported a standalone course, but she also recommended, *'I would support having a course on sustainability and to have ESD concepts infused in other existing courses. It is only then that the teachers will be able to implement sustainability principles at the classroom level because they would know that it's integrated in all subjects.'* (O2)

Whereas Bernstein (1990) refers to the convergence of environmental, social and economic spheres to blur subject boundaries, Wals (2013) encourages HEIs to reposition themselves as agents of change, actively co-creating knowledge with other key stakeholders in education systems (*cf.* 2.8.1). In this study, two such key stakeholders are organisation G1 and organisation G2.

Sammalisto and Lindhqvist (2008) have such supporting agents – outside education systems – in mind when they point out that the level of integrating sustainability concepts ranges from policy formulations to integrating courses, curricula and extra-curricular activities to realise a total reform of an educational system (*cf.* 2.8.2). The extra-curricular activities in part promote trans-disciplinarity that lecturer T4 referred to when she stated, *'There should be trans-disciplinarity, cross-pollination and themes beyond subject topics. We are in the baby steps policy wise, still crafting policies and sensitizing teacher educators. We are slow at implementing. We don't act fast.'*

Participant T1 emphasised a protracted process approach, starting small and scaling up later. She suggested, *'Manage change process by process, that which you can influence closer to you. Start small, think big and make sure you act. I have managed to start small from students by engaging them. Infusion and integration are possible at course outline level. Start small and upscale to a complete level – design material as that of Sustainability Starts with Teachers enquiry-based learning (it blends well). A module that is composed of different subjects – the bits will make the whole.'* She further suggests, *'…a standalone subject at…primary school…for effective sustainability integration into curriculum practices. Sustainability can be integrated using an integrative module that combines environmental and sustainability education and climate change education. Government should be intentional about its people becoming knowledgeable from primary level education. The TTIs also need a standalone integrative module that starts in first year. Handling bits and pieces is not sustainable.'*

The views of lecturers not only expressed the desire for a type of ESE integration that is holistic, relevant and workable, but one that also recognises the importance of community assets such as Indigenous Knowledge (IK) which is discussed as the fourth category of theme three in the next section.

Category Four: Utilising IK for effective ESE Integration

The understandings and relations that constitute what is known as Indigenous Knowledge Systems (IKS) are typical understandings, skills and philosophies that emerge out of societies. As such, according to Vidal (2019), they are systems about the interconnectedness of things that operate together to increase what is already in existence. Luu (2019), however, points out that global policies still fail to recognise that indigenous and local peoples have for a long time contributed to the wellbeing of the earth's biosphere.

Thomas (2022) asserts that IKS promote authentic relationships because such systems know very well how important they impact the transfer of knowledge. Hence, educators can learn from IKS how to establish their teaching and learning in community and place-based contexts. The addition by Thomas (2022) that the physical environment of learners has always provided learning contexts for indigenous education was further confirmation that IK can contribute to ESE integration. As such investigating the state of IK formed part of this study as the next section reveals.

Whereas participants for this study acknowledged that IK provided relevant contexts for ESE integration, they did not explicitly support the application of IK for effective ESE integration. Prioritising and promoting IK in TTIs was seen by lecturers as an important contribution to relevant contextual settings capable of supporting effective ESE integration.

Lecturer T4 asserted, *'Pre-service teachers have indigenous knowledge and I see it as being foundational to good Pedagogical Content Knowledge relating with sustainability education. Indigenous knowledge creates the context to start the teaching-learning experience. Indigenous knowledge and sustainability education are complementing units. Students have a fair amount of knowledge on Eswatini Biodiversity and Eswatini Environment Authority By-laws that protect our fauna and*

flora. Indigenous knowledge is taught to primary school learners and pre-service teachers need adequate equipping to be able to teach it well.'

Writing on behalf of the UNESCO Local and IKS programme, Liebenberg (2021) confirms that the environmental conservation sector is giving greater recognition and respect to the knowledge systems of indigenous peoples. The need for such a form of understanding was pointed out by participant T1 when she posited, *'Yes, students relate to indigenous knowledge, the 'Mhlonyane', eucalyptus and other traditional remedies. One time during a lesson, the students wanted to verify if indigenous knowledge was relevant. They were not sure that it would be accepted in the modern setting. They asked about 'Umsuthane'. Therefore, we should not leave out the home 'stuff'.'*

Lecturers who envisioned a standalone module as a potential reality, shared different views in support of such a form of ESE integration. Lecturer T4 advocated *'the need to promote 'ekhaya' values as a powerful idea and heritage knowledge will be added within the consumer science, traditional ways of producing medicine and preserving food will be part of curriculum transformation.'* These are the same values mentioned by Thomas (2022) as impacting our actions and choices in education systems.

Thomas (2022) further explains that whereas formal schooling is characterised by highly individualistic and competitive ways of learning, IK systems promote learning that is holistic and experiential in nature and is best mediated in collaborative contexts that value relationality and the sustaining of the collective. Bruchac (2014) adds that oral traditions – that in part constitute IK – in whichever form they are communicated, can reinforce other forms of knowledge because as community knowledge storage systems, they are regularly recounted and periodically verified by knowledgeable elders. Such insightful explanations detailed with originality – as pointed out by Bruchac (2014) – have the capacity to support the integration of ESE into TTI curriculum practices as PSTs are prepared for teaching and integrating ESE into their curriculum planning and teaching practices.

Lecturer T6 was very specific as he narrated how IK can support ESE integration. With reference to the subject content from his field of specialisation, he submitted, *'The Khoisan interacted with nature and respected it using Indigenous Knowledge as a hunter-gathering society. They conserved and never over-exploited the natural*

resources around them. Their interaction with the physical and biological components was sustainable in nature. They managed the environment exceedingly well and teaching about them would empower PSTs and facilitate their ability to integrate ESE...'

This orientation to curriculum thinking is necessary to accommodate shifting ideological changes such as those highlighted by Ulmer and Wydra's (2020) study that covered 16 African nations (*cf.* 2.6.2). In that study, the topics discussed included the use of local languages, the application of IK and the value of culture in HEIs sustainability approaches. Ulmer and Wydra (2020) highlighted the intrinsic values of language and culture for successful integration of sustainability into HEIs practices, which aligns with Loubser (2011) that quality teaching and learning experiences depend partly on locally contextualised relevant curricula (*cf.* 3.2.1.4).

Knowledge developed within indigenous societies covers multiple areas that are valuable to ESE integration because they touch on many issues linked to the quality of life on planet earth. IK has the potential to provide interactive heuristic learning approaches that lean towards problem solving and discovery learning Liebenberg (2021).

In this research study, I consider the addition of IK to the suggested standalone module to be of great value because of the potential such an action would have in terms of creating opportunities to catalogue and document IK in such a way that its relevance is explicitly shared within specific local ESE contexts. Creating a standalone ESE subject as a form of ESE integration where transdisciplinarity is promoted translated into designing a constructivist educative model for sustainability (*cf.* 3.2.1.4), the proposed implementation framework (*cf.* Figure 6.1).

Overall, the most common points raised by participants were summed up in three themes highlighting the fact that ESE mediation experiences in TTIs need support in order to realise effective ESE integration into TTI curriculum practices as the attempt to interface SDG 4 targets 4.7 and 4c with TTI curriculum practices is prioritised.

5.3.3 Documentary Data

Data collection in form of curriculum document analysis was carried out in three curriculum fields that Bernstein (1990) labelled as the ORF, PRF and the RF (*cf.* 4.4.2.2). Bernstein (1990) suggests that at different levels of communication – which Carl (2010) categorised as national, departmental, institutional and classroom levels – unmediated curriculum texts are converted into pedagogic knowledge suggesting that knowledge made available through research undergoes the process of recontextualisation by the time it is converted to classroom talk.

The recontextualisation field is divided into the ORF usually created by the state and dominated by government departments and the PRF, where teacher trainers and curriculum designers are found at institutional level. The ORF create pedagogic texts from knowledge produced through research efforts in such a way that pedagogical practices are carried out using pedagogic texts created out of the ORF texts. The third field in pedagogic communication is the RF which is formed by schools and HEIs. In this study, PSTs operating within the reproduction field were supposed to make use of texts generated in the PRF at institutions TA and TE to construct their own teaching practice pedagogic texts. In the next section, the analysis process is discussed to show the extent of ESE integration into official documents used by institutions TA and TE.

5.3.3.1   *The analysis of the extent of ESE integration into the ORF texts of institutions TA and TE*

Three official documents meant to guide curriculum practices of institutions TA and TE as they prepare PSTs to teach and integrate ESE into their curriculum planning and teaching practices, were identified in this study. The three documents are the Eswatini National Education and Training Sector Policy (ENETSP) (2018) (Eswatini Government, 2018); the 2015 to 2020 Strategic Plan of institution TA; and the UNESCO Education for SDGs Learning Objectives UNESCO (2017a). The three documents were analysed to determine the extent to which ESE was integrated into their introduction and content.

5.3.3.1.1 The Eswatini National Education and Training Sector Policy (2018) document

This 81-page document is divided into three sections: Sections A and B deal with sector-wide policy goals and objectives respectively. Section C contains content related to policy implementation. Worth noting is the fact that ESD is included as a key component of institutional development. In this document, there is provision for an ESD strategic framework based on the belief that for SD to be achieved in Eswatini, the education and training system needs to reflect the SDGs as the quality of education within the framework of SD is strengthened. This document – also available online from the Eswatini Government website www.gov.sz (Eswatini Government, 2018) – is a curriculum policy document guiding the operations of institution TE.

5.3.3.1.2 The strategic plan of institution TA

Institution TA developed a strategic plan to direct the annual operational plans of teacher training. The process for the development of the teacher training operational plans hinges on promoting excellence in teaching and learning as academic programmes are assessed and evaluated on a regular basis. Strategic focus area 01, strategic objective 1.3 in the 2016 strategic plan review states that by 2020, institution TA will have transformed academic staff to ensure relevance and effectiveness in teaching and delivery of high-quality programmes. Such academic staff transformation focusing on relevance, it was added, would entail introducing ESD to students. The strategic plan is used by institution TA to guide its operational plans.

5.3.3.1.3 The UNESCO Education sector SDGs learning objectives.

The official curriculum document 'Education for Sustainable Development Goals learning objective' is a document released by the UNESCO education sector to provide guidance and suggestions that educators – including those of HEIs – can adapt to fit different learning contexts. This curriculum text was, in part, produced to guide educators in innovative ways of introducing pedagogies that empowered learners by introducing them to sustainability principles capable of transforming the way they think and act. Ideally, this text as a curriculum document should have been used by institutions TA and TE to meaningfully participate in the Global Action Programme on ESD. The 62-page document consists of two main sections. The first section comprises of learning objectives for achieving the SDGs and the second

section contains guidelines on implementing learning for the SDGs through ESD. With this curriculum content, educators are expected to use the official text as a resource when developing their own curriculum material as curriculum designers. The core part of the document summarises key competencies for learners to develop in ESD.

5.3.3.1.4 *The analysis procedure*

As indicated in Section 4.3.3.2, the analysis of the ORF curriculum texts was guided by the Bernsteinian-based analytical tool adapted from one originally designed by Nsubuga (2011). The five steps that were followed in order to design the analytical tool were given in Section 4.3.3.2, part (i). As indicated in the analytical tool (refer to Table 5.28) used to analyse the three ORF documents, three criteria were identified to structure the analysis process. The table shows the scaling grids used to grade the performance of each indicator in relation to the extent of ESE integration into each of the criteria.

Table 5.28: Analytical tool used to analyse the extent of ESE integration into Official Curriculum Texts (ORF) used in institutions TA and TE

Criterion	Indicator	C++ Very Weak Integration	C+ Weak Integration	C- Strong Integration	C- - Very Strong Integration
Introduction and Foreword	a. Mention of ESE in introduction and foreword	No mention at all of issues relating to ESE in introduction and foreword	Unclear mention of issues relating to ESE in introduction and foreword	Implicit mention of issues relating to ESE in introduction and foreword	Explicit mention of issues relating to ESE in introduction and foreword
Content specific to ESD	b. Mention of content specific to ESD	No mention at all of ESD	Unclear mention of ESD	Implicit mention of ESD	Explicit mention of ESD
Content specific to Sustainable Development Goal 4, targets 4.7 and 4c	c. Mention of Content specific to Sustainable Development Goal 4, targets 4.7 and 4c	None of the content is specific to Sustainable Development Goal 4, targets 4.7 and 4c	Less than 10% of the content is specific to Sustainable Development Goal 4, targets 4.7 and 4c	Between 10% and 20% of the content is specific to Sustainable Development Goal 4, targets 4.7 and 4c	More than 20% of the content is specific to Sustainable Development Goal 4, targets 4.7 and 4c

(Source: Adapted from Nsubuga, 2011).

5.3.3.1.5 Results of the analysis of the ORF texts used by institutions TA and TE

Indicator a: Mention of ESE in Introduction

This indicator analysed the extent to which ESE had been integrated in the three ORF texts by determining how ESE was referred to in the introduction of each of the three documents. In the ENETSP (2018) document, there is the statement:

> The revised policy also contextualises and enables the many associated policy instruments required to operationalise the delivery of high-quality teaching and learning, especially the United Nations 2030 Agenda for SD. The revised policy content also includes instruments of regional cooperation and integration such as the African Union's Agenda 2063 for Africa's socio-economic transformation (Eswatini Government, 2018).

In this introduction, there is an explicitly stated link to ESE issues. Using the scaling grid of this indicator (refer to Table 5.28), the integration of ESE in this introduction was judged to be very strong which corresponds to a classification level of C-- indicating very strong ESE integration into the introduction of this document.

The introduction of the 32-page document of the strategic plan for institution TA has no mention at all of issues relating to ESE. Using the scaling grid for indicator a, the integration of ESE in the introduction of this curriculum text was judged to be very weak, which corresponds to a classification level of C++.

Both the foreword and introduction of the curriculum text released by UNESCO education sector contain frequent mentions of ESE issues. Using the scaling grid of this indicator (refer to Table 5.28), the integration of ESE in this foreword and introduction was judged to be very strong which corresponds to a classification level of C-- indicating very strong ESE integration into the foreword and introduction of this document.

Indicator b: Mention of content specific to ESD

This indicator analysed ESE integration by reviewing the extent to which ESD was mentioned in each of the three ORF curriculum texts. The content of the ENETSP (2018) is structured in such a way that in the sector-wide policy goals and objectives for institutional development, there is mention of ESD policy: rationale, goal, objective

and strategic framework where it is clearly stated that the ESD policy goal is to implement the Agenda 2030 policy goal on education and related policy goals, in support of SD in Eswatini. However, the teacher development section, the teacher pre-service education and training policy: rationale, goal, objective and strategic framework do not in any way mention ESD. Based on the scaling grid for this indicator (refer to Table 5.28), the overall extent of integration of ESE based on the mention of content specific to ESD was judged to be strong integration and was allocated a score of C-.

The content of institution TA's Strategic Plan (2015-2020) indicates that the academic staff transformation for relevance would include introducing ESD to PSTs in the faculty – strategic objective 1.3d. Based on the scaling grid for indicator b as shown in Table 5.28, the overall extent of ESE integration into the strategic planning at institution TA was judged to be weak integration and was allocated a score of C+.

As a curriculum document designed to help with introducing education SDGs in educational institutions, the content of the 'UNESCO Education for SDGs Learning Objectives' text is dominated not only with learning objectives for achieving the SDGs, but also strategies to integrate ESD in policies, strategies, programmes, textbooks and other teacher education texts among others. Concerning the promotion of ESD, it states:

> To integrate ESD more fully into teacher education, the content and the
> organisation of teacher education programmes should be developed with
> the participation of key stakeholders such as students, teachers, local
> NGOs and ESD experts (UNESCO, 2017a:52).

Based on the scaling grid for this indicator (refer to Table 5.28), the overall extent of integration of ESE in the 'UNESCO Education for SDGs Learning Objectives curriculum text' was judged to be very strong and was given a classification value of C--.

Indicator c: Mention of content specific to SDG 4 targets 4.7 and 4c

Of the three ORF curriculum texts discussed in this section, only the 'UNESCO Education for SDGs Learning Objectives' document has content explicitly mentioning SDG 4 targets 4.7 and 4c. Based on the scaling grid for this indicator (refer to Table

5.28), the overall extent of integration of ESE in the UNESCO Education for SDGs Learning Objectives curriculum text was judged to be very strong and was given a classification value of C--.

Since the ENETSP (2018) and the institution TA Strategic Plan (2015-2020) do not mention SDG 4 targets 4.7 and 4c, based on this indicator, these two ORF texts were judged to have very weak ESE integration into their texts and were given a classification value of C++.

5.3.3.1.6 Overall results of ESE integration into the ORF curriculum texts

The overall results of the analysis of the extent of ESE integration into the ORF documents are summarised in Tables 5.29, 5.30 and 5.31.

Table 5.29: The overall extent of ESE integration into the Eswatini National Education and Training Sector Policy (2018)

Indicator used in the Framework	Classification level attained by indicator
Mention of ESE in introduction	C--
Mention of Content specific to ESD	C-
Mention of Content specific to SDG 4 targets 4.7 and 4c	C++

(Source: Compiled by the researcher)

Table 5.30: The overall extent of ESE integration into the Strategic Plan of institution TA (2015 – 2020)

Indicator used in the Framework	Classification level attained by indicator
Mention of ESE in introduction	C++
Mention of Content specific to ESD	C+
Mention of Content specific to SDG 4 targets 4.7 and 4c	C++

(Source: Compiled by the researcher)

Table 5.31: The overall extent of ESE integration into the UNESCO education for SDGs learning objectives

Indicator used in the Framework	Classification level attained by indicator
Mention of ESE in introduction	C--
Mention of Content specific to ESD	C--
Mention of Content specific to SDG 4 targets 4.7 and 4c	C--

(Source: Compiled by the researcher)

5.3.3.2 The analysis of the extent of ESE integration into the PRF texts of institutions TA and TE

As pointed out in Section 4.4.2.2 part (i), I analysed course outlines used by lecturers whom I interviewed. A total of seven course outlines were secured from institution TA and three from institution TE (refer to Tables 5.32 and 5.33). In the context of this study, course outlines are PRF texts that lecturers as curriculum agents within the PRF designed from ORF curriculum texts. Worth noting is the fact that whereas institution TA is a private TTI, TE is a HEI fully controlled by government. It was therefore important to analyse the PRF texts separately to be able to compare the nature of relationships between the ORF and the PRF separate contexts of the two institutions.

5.3.3.2.1 The course outlines used as PRF texts at institutions TA and TE

The term course outline – as used in this study – refers to documents containing key information about the different courses taken by PSTs in Eswatini as they are prepared to teach and integrate ESE into their curriculum planning and teaching practices. These curriculum documents contain important information, such as course description and schedule, learning outcomes and assessment tasks. In addition, they have lists of prescribed texts and recommended readings. For this study, versions of course outlines approved for use by heads of institutions TA and TE were analysed to establish the extent to which they integrated ESE issues as PRF curriculum texts. Because the two TTIs operate using different guidelines prescribed in line with the ORF curriculum text resources, the course outlines were categorised as either belonging to institution TA or institution TE and in these two categories they were analysed. The analytical tool used to analyse the extent of ESE integration into selected course outlines of institutions TA and TE is shown in Tables 5.32 and 5.33 respectively.

Table 5.32: Course outlines for institution TA

Subject	Course Code	Course Aim(s) and/or Objectives	Listed Main Course Topics
History	MWH 301	1. Describe how the Scientific Revolution's impact on religious, political and cultural institutions challenged how people viewed the world. 2. Analyse the social, political and economic effects of	1. Age of enlightenment: 1600-1800 2. Age of revolutions: 1750-1914 3. Imperialism: 1800-1914 4. Achievements and Crises: 1900-1945 5. The Cold war: 1945-1991

Subject	Course Code	Course Aim(s) and/or Objectives	Listed Main Course Topics
		industrialization on Western Europe and the world. 3. Describe how imperialism involved land acquisition, extraction of raw materials, and the spread of Western values and maintenance of political control. 4. Explain how militarism, Imperialism, nationalism and alliances were causes of World War 1. 5. Analyse how the United States and the Soviet Union became superpowers and competed for global influence. 6. Describe how regional and ethnic conflict in the post-cold war era have resulted in acts of terrorism, genocide and ethnic cleansing.	6. Globalisation: 1991-present
History	SSR 101	1. To introduce students to the theories of studying History. 2. To introduce students to oral traditions. 3. To introduce students to archaeology.	1. The historian and his facts 2. History, science and morals 3. Archaeology 4. Oral Traditions
Science (Biology)	SCI 102	1. Ability to use and apply the processes of science. 2. Understanding of basic scientific concepts. 3. Understanding of the nature, aims and general limitations of science.	1. The cell as a functional unit 2. Classification of living organisms 3. Transport and nutrition in flowering plants
Science (Biology)	SCI 201	1. Ability to use and apply the processes of science. 2. Understanding of basic scientific concepts. 3. Understanding of the nature, aims and general limitations of science.	1. Digestion 2. Respiratory system
Biology	SAP 301	Not given	1. Blood and the circulatory system 2. Nervous co-ordination 3. Genetics 4. Man and the environment

Subject	Course Code	Course Aim(s) and/or Objectives	Listed Main Course Topics
Educational Technology /EDUTECH	ETH 301	1. Reflect on the role various forms of electronic and digital technology can play in the teaching /learning process. 2. Plan instruction that addresses and solves complex learning problems for individual students. 3. Have a repertoire of instructional methods and media to select from and use which most effectively and efficiently influence student learning.	1. Introduction to the course 2. Digital divide 3. How to prepare technology-enhanced lessons in my classroom 4. How to use technological devices to improve teaching and learning during unprecedented times such as National Lockdowns:
Curriculum Theory	ETH 301	1. To define the word Curriculum 2. State how Curriculum is designed 3. Discuss any 2 models on Curriculum development 4. Highlight the different types of Curriculum 5. Draw and discuss the stages of Curriculum development 6. Explore the National Curriculum Centre drawing of designing the Swazi Curriculum. 7. Analyse the Curriculum for the 21st Century.(Competency based Curriculum) 8. Explore the Curriculum development as stated in the Swazi Education and Training Sector Policy of 2011. 9. Define change 10. Discuss reasons why people resist change 11. Discuss why it is important to change Curriculum to suit the global world. 12. Explore why teachers have to adapt to change in Curriculum.	1. Define the word curriculum at least by three authors. 2. State how curriculum is designed 3. Discuss curriculum development models by: a. The different types of curriculum b. Stages involved in Curriculum development(drawing) c. The determinants of a Curriculum d. The competency based Curriculum e. Define change

(Source: Compiled by the researcher)

Table 5.33: Course outlines for institution TE

Subject	Course code	Course Aim(s) and/or Objectives (not provided)	Listed main course topics
Science education	SCI 221		Science curriculum -Teaching approaches in Science -Teaching methods

			-Assessment -Practical work in science and improvisation -General Laboratory techniques and stock control -Laboratory management and safety -Planning for a lesson -Teaching practice -Science and society -Motivation -Resource materials -Current learning theories -Nature of Science (NOS) in secondary science classrooms

(Source: Compiled by the researcher)

(The complete table with Course outlines for institution TE is shown in Appendix M)

5.3.3.2.2 Results of the analysis of the PRF texts used by institution TA

Table 5.34: Analytical tool used to analyse the extent of ESE integration into selected course outlines (PRF) of institutions TA and TE

Criterion	Indicator	C++ Very Weak Integration	C+ Weak Integration	C- Strong Integration	C- - Very Strong Integration
Course aim(s) and objective(s)	a. Mention of ESE in aim(s) and objective(s)	No mention at all of ESE in the aim(s) and objective(s)	Unclear mention of ESE in the aim(s) and objective(s)	Implicit mention of ESE in the aim(s) and objective(s)	Explicit mention of ESE in the aim(s) and objective(s)
Content	b. Mention of ESE in the content	None of the content topics were linked to ESE	Less than 10% of the content topics are linked to ESE	Between 10% and 20% of the content are linked to ESE	More than 20% of the content topics are linked to ESE

(Source: adapted from Nsubuga, 2011)

Indicator a: Course aim(s) and Objective(s)

This indicator analysed the extent to which ESE had been integrated into the seven course outlines used by the three lecturers whom I interviewed at Institution TA by determining how ESE was referred to in the course aim(s) and objective(s) of each course outline. A careful scrutiny of the course aim(s) and objective(s) of the seven course outlines that was carried out in order to determine which ones referred to ESE in the course aim(s) and objective(s) revealed that none of the course outlines' course aim(s) and objective(s) referred to ESE in any way.

According to the scaling grid of this indicator (refer to Table 5.34), the integration of ESE in the course aim(s) and objective(s) of the seven course outlines was judged to be very weak and was allocated a classification level C++.

Indicator b: Reference to ESE issues in the content

This indicator analysed the extent to which ESE had been integrated into the content of the course outlines.

Using the scaling grid of this indicator (refer to Table 5.34), the integration of ESE into the content topics of the seven course outlines was judged to be very weak and was allocated a classification level C++.

Indicator c: Reference to ESE issues in assessment and evaluation

This indicator analysed the extent to which ESE had been integrated in the assessment and evaluation tasks mentioned in the course outlines.

Using the scaling grid of this indicator (refer to Table 5.34), the integration of ESE in the assessment and evaluation tasks of the seven course outlines was judged to be very weak and was allocated a classification level C++.

5.3.3.2.3   Results of the analysis of the PRF texts used by institution TE

Indicator a: Course aim(s) and Objective(s)

This indicator analysed the extent to which ESE had been integrated into the three course outlines used by the three Institution TE lecturers by determining how ESE was referred to in the course aim(s) and objective(s) of each course outline. A thorough examination of the course aim(s) and objective(s) of the three course outlines which was carried out in order to establish which ones referred to ESE in the course aim(s) and objective(s) showed that none of the course outlines' aim(s) and objective(s) referred to ESE at all.

According to the scaling grid of this indicator (refer to Table 5.34), the integration of ESE in the course aim(s) and objective(s) of the three course outlines was judged to be very weak and was allocated a classification level C++.

Indicator b: Reference to ESE issues in the content topics

This indicator analysed the extent to which ESE had been integrated into the content topics of the course outlines.

Using the scaling grid of this indicator (refer to Table 5.34), the integration of ESE in the content topics of the three course outlines was judged to be very weak and was allocated a classification level C++.

Indicator c: Reference to ESE issues in assessment and evaluation

This indicator analysed the extent to which ESE had been integrated into the assessment and evaluation tasks.

Using the scaling grid of this indicator (refer to Table 5.34), the integration of ESE into the assessment and evaluation tasks of the three course outlines was judged to be very weak and was allocated a classification level C++.

5.3.3.2.4 Overall results of ESE integration into the PRF curriculum texts

The overall result of the analysis of the extent of ESE integration into the PRF documents is that there was very weak ESE integration into the PRF curriculum texts as all the analysed texts were allocated a classification level C++.

5.3.3.3 The analysis of the extent of ESE integration into the Reproduction Field (RF) texts of institutions TA and TE

According to Bernstein (1990), the reproduction field is concerned with reproducing pedagogic texts and practices that in this study occurred during teaching practice as PSTs made use of curriculum texts acquired during the teacher training experiences in institutions TA and TE. In this study, PSTs produced teaching practice curriculum texts discussed in the following section.

5.3.3.3.1 The analysis of the extent of ESE integration into the teaching practice curriculum texts of PSTs of institutions TA and TE.

For this study, what was considered as teaching practice curriculum texts used by PSTs during their teaching practice exercise consisted of individually written texts and charts that PSTs prepared and used during the lessons that were observed. All the teaching practice curriculum texts were individually analysed as used on the day each of the four lessons were observed. The analysis of the extent of ESE integration into

the teaching practice curriculum texts revealed that none of the four PSTs made any reference to ESE issues in their texts for any of the five indicators used (refer to Table 5.35). Using the scaling grid for all the five indicators, the overall integration of ESE into the teaching practice curriculum texts was judged to be very weak, which corresponds to a classification level of C++.

Table 5.35: The analytical tool used to analyse the extent of ESE integration into teaching practice curriculum texts used by PSTs

Criteria	Indicator	C++ Very Weak Integration	C+ Weak Integration	C- Strong Integration	C- - Very Strong Integration
Lesson content	a. Nature of reference in teaching practice notes	No references linking teaching practice notes to environmental and sustainability issues	General references linking teaching practice notes to environmental and sustainability issues	Implicit references linking teaching practice notes to environmental and sustainability issues	Explicit references linking teaching practice notes to environmental and sustainability issues
Educational resources	b. Type of educational resources used in the lesson	None were specific to environmental and sustainability issues	Deployed resources general to environmental and sustainability issues	Deployed resources with implicit reference to environmental and sustainability issues	Deployed resources with explicit reference to environmental and sustainability issues
Learner activities	c. Quality of practical activities related to environmental and sustainability issues	None related specifically to environmental and sustainability issues	Practical activities were general to environmental and sustainability issues	Practical activities were implicitly related to environmental and sustainability issues	Practical activities were explicitly related to environmental and sustainability issues
Knowledge application	d. Nature of reference to ESE during knowledge application sessions	No reference at all to environmental and sustainability issues	References were not specific to environmental and sustainability issues	Implicit references to environmental and sustainability issues	Explicit references to environmental and sustainability issues
Assessment tasks	e. Nature of reference to ESE in assessment tasks	No assessment tasks were specific to environmental and sustainability issues.	Assessment tasks were general to environmental and sustainability issues	Assessment tasks had implicit references to environmental and sustainability issues	Assessment tasks had explicit references to environmental and sustainability issues

(Source: adapted from Nsubuga, 2011)

5.3.4 Lesson Observation Data

Lesson observation data entailed analysing the extent to which ESE was integrated into lessons and the relative degree of control observed in these lessons as they were carried out by PSTs. The process that guided lesson observation was underpinned by constructivist principles that formed part of the theoretical framework of this study. Lesson observations were carried out to determine how learners acquired knowledge into which ESE was supposed to be integrated. I was interested in observing ESE integration into lessons as learners experientially constructed their own understanding and knowledge. In Chapter two of this study, it was indicated by Burns (2011), among others (*cf.* 2.8.2), that the best ESE curriculum models promoted transitioning from transmissive teaching models to transformative learning processes.

5.3.4.1 The analysis of the extent of ESE integration into lessons conducted by PSTs

This section presents the results of the analysis of the extent of ESE integration into the four lessons that were observed as part of teaching practice carried out by PSTs. For PSTs S1 and S2, the lessons were carried out inside classrooms of primary schools P1 and P2 respectively; but for PSTs S3 and S4, the lesson observations took place in a laboratory of institution TE where micro-teaching was conducted by the science lecturer – their resident teaching practice supervisor. The lessons were observed after prior arrangement with the PSTs and were therefore treated as representing the PSTs best classroom practices.

Table 5.36: The analytical tool used to analyse the extent of ESE integration into TTI lessons carried out by PSTs

Criteria	Indicator	C++ Very Weak Integration	C+ Weak Integration	C- Strong Integration	C- - Very Strong Integration
Lesson content	a. Nature of reference to lesson content	No references linking lesson to environmental and sustainability issues	General references linking lesson to environmental and sustainability issues	Implicit references linking lesson to environmental and sustainability issues	Explicit references linking lesson to environmental and sustainability issues
Educational resources	b. Type of educational resources	None were specific to environmental and	Deployed resources general to environmental	Deployed resources with implicit reference to	Deployed resources with explicit reference to

Criteria	Indicator	C++ Very Weak Integration	C+ Weak Integration	C- Strong Integration	C- - Very Strong Integration
	used in the lesson	sustainability issues	and sustainability issues	environmental and sustainability issues	environmental and sustainability issues
Learner activities	c. Quality of practical activities related to environmental and sustainability issues	None related specifically to environmental and sustainability issues	Practical activities were general to environmental and sustainability issues	Practical activities were implicitly related to environmental and sustainability issues	Practical activities were explicitly related to environmental and sustainability issues
Verbal interaction in discussion	d. Nature of reference to ESE during verbal interaction in discussion sessions	No reference at all to environmental and sustainability issues	References were not specific to environmental and sustainability issues	Implicit references to environmental and sustainability issues	Explicit references to environmental and sustainability issues
Knowledge application	e. Nature of reference to ESE during knowledge application sessions	No reference at all to environmental and sustainability issues	References were not specific to environmental and sustainability issues	Implicit references to environmental and sustainability issues	Explicit references to environmental and sustainability issues
Lesson based assessment tasks	f. Nature of reference to ESE in the assessment tasks during lesson	No assessment tasks were specific to environmental and sustainability issues.	Assessment tasks were general to environmental and sustainability issues	Assessment tasks had implicit references to environmental and sustainability issues	Assessment tasks had explicit references to environmental and sustainability issues

(Source: adapted from Nsubuga, 2011)

Considering all the six indicators (refer to Table 5.36), each of the four PSTs integrated ESE issues the same way; that is, there was not a single moment when they referred to ESE issues even when the lesson afforded an opportunity to do so. For example, PST S4 taught a lesson on photosynthesis and made reference to the gas carbon dioxide, but did not in any way link that reference to the 21st century climate change challenges. Also, PST S3 taught a topic on waves, used a very good teaching aid of sea waves, but was not able to relate it to ESE. Even PST S2 taught a geography lesson on natural resources, but did not clearly relate the lesson content to ESE. Worth noting was that PST S1 who taught a mathematics lesson using blocks that had been made from recycled pieces of wood, also did not in any way refer to ESE matters; for example by explaining how practices such as the recycling of wood helps to keep the

environment clean. Since I assumed that the more explicit references to ESE are taught during the lesson, the stronger the integration of ESE from the just presented discussion, the overall extent of ESE integration in all the four lessons observed for all the six indicators used, was judged to be very weak and was given a classification score of C++. This score indicates very strong isolation between the lessons taught by PSTs and ESE matters.

5.3.4.2 Overall results of ESE integration into the RF

The five indicators that guided the analysis of the extent ESE integration into teaching practice curriculum texts used by PSTs in institutions TA and TE showed that for all the four PSTs, there was very weak ESE integration. In addition, the six indicators that guided the analysis of the extent of ESE integration into the four lessons conducted by PSTs indicated very weak ESE integration. Overall, the indicators showed that in the reproduction field, the pedagogic texts and practices reproduced by PSTs had very weak ESE integration.

5.3.4.3 The analysis of the relative degree of control in lessons conducted by PSTs

As previously explained in Section 4.3.3.2 Section (i) of this study, I analysed the relationship between teachers and learners by determining the relative degree of control – which Bernstein (1990) referred to as Framing – in learning spaces utilised by PSTs. The analytical tool used to discover how knowledge was selected, organised, transmitted and utilised in the reproduction field during the teaching practice carried out by PSTs, is shown in Appendix K.

For each of the four lessons that I observed, the PSTs in each of the lessons showed dominance over the selection, sequencing and pacing of the curriculum content they were dealing with during the lesson; that is, the selection not only of the whole lesson content but also that of educational resources and activities. Additionally, the lesson sequencing, which is the control of the order of teaching and learning experiences in class, were completely dominated by the PST. More still, the pacing of the lesson from beginning to end did not include any input from learners, not even the control of tasks carried out by the learners. According to Bernstein (1990), the level of framing of instructional knowledge was very strong. Using the scaling grid for framing (refer to Appendix K), for all the four lessons, all the indicators for selection, sequencing and

pacing were judged to be very strong framing and were collectively allocated a framing level of F++.

5.3.5 Field Observation Data

As part of my investigation to discover how PSTs were prepared to teach and integrate ESE into their curriculum planning and teaching practices, I carried out field observations of the built physical structures, grounds and their surrounding areas, simultaneously observing what was practised in these settings. As explained in Section 4.4.2.3 of this study, the four field contexts that I observed consisted of fields of institutions TA and TE and those of two primary schools P1 and P2, where teaching practice for PSTs in TA and TE is usually conducted. The process of collecting data by field observations was guided by Rogan and Grayson's (2003) Theory of Curriculum Implementation where the construct 'Capacity to support innovation' was applied (refer to Table 5.37). Rogan and Grayson (2003) insist that the good ideas in curriculum policy documents – labelled as the ORF curriculum texts by Bernstein – can best be monitored by using a framework which gauges contexts of an institution by considering its leadership, the learners and their teachers (*cf.* 3.2.3).

Table 5.37: Profile of the capacity to support innovation

Level	Physical Resources	Teacher Factors	Learner Factors	School Ecology and Management
1	Basic buildings – classrooms and one office, but in poor condition. Toilets available. Some textbooks – not enough for all.	Teacher is under-qualified for position, but does have a professional qualification.	Learners have some proficiency in language of instruction, but several grades below grade level.	*Management* A timetable, class lists and other routines are in evidence. The presence of the principal is felt in the school at least half the time, and staff meetings are held at times. *Ecology* School functions i.e. teaching and learning occur most of the time, albeit erratically. School is secure and access is denied to unauthorized personnel.
2	Adequate basic buildings in good condition.	Teacher has the minimum qualification for position.	Learners are reasonably proficient in language of instruction.	*Management* Teacher attends school/classes regularly.

Level	Physical Resources	Teacher Factors	Learner Factors	School Ecology and Management
	Suitable furniture – adequate and in good condition. Electricity in at least one room. Textbooks for all. Some apparatus for science.	Teacher is motivated and diligent. Enjoys his/her work. Teacher participates in professional development activities. Teacher has a good relationship with and treatment of learners.	Learners attend school on a regular basis. Learners are well nourished. Learners are given adequate time away from home responsibilities to do school work.	Principal is present at school most of the time and is in regular contact with his/her staff. Timetable properly implemented. Extramural activities are organized in such a way that they rarely interfere with scheduled classes. Teachers/learners who shirk their duties or display deviant behaviour are held accountable.

Ecology
Responsibility for making the school function is shared by management, teachers and learners to a limited extent. A School Governing Body is in existence. Schools functions all the time i.e. learning and teaching always take place as scheduled. |
| 3 | Good buildings, with enough classrooms and a science room. Electricity in all rooms. Running water. Textbooks for all pupils and teachers. Sufficient science apparatus. Secure premises. Well-kept grounds. | Teacher is qualified for position and has a sound understanding of subject matter. Teacher is an active participant in professional development activities. Conscientious attendance of class by teacher. Teacher makes an extra effort to improve teaching. | Learners are proficient in language of instruction. Learners have access to quiet, safe place to study. Learners come from a supportive home environment. Learners can afford textbooks and extra lessons. Parents show interest in their children's progress. | *Management* Principal takes strong leadership role, is very visible during school hours. Teachers and learners play an active role in school management.

Ecology
Everyone in the school is committed to making it work. Parents play active role in School Governing Body and in supporting the school in general. |
| 4 | Excellent buildings. One or more well equipped science laboratory. | Teacher is over-qualified for position and has an excellent knowledge of content matter. | Learners are fluent in the language of instruction. Learners take responsibility for | *Management* There is a visionary, but participatory, leadership at the school. |

Level	Physical Resources	Teacher Factors	Learner Factors	School Ecology and Management
	Library or resource centre. Adequate curriculum materials other than textbooks. Good teaching and learning resources (e.g. computers, models). Attractive grounds. Good copying facilities.	Teacher has an extraordinary commitment to teaching. Teacher shows willingness to change, improvise and collaborate, and has a vision of innovation. Teacher shows local and national leadership in professional development activities.	their own learning. Learners are willing to try new kinds of learning.	*Ecology* There is a shared vision. The school plans for supporting and monitoring change. Collaboration of all stakeholders is encouraged and practised.

(Source: Adopted from Rogan and Grayson, 2003:1188-1190)

In this study, I applied the profile of the capacity to support innovation and I adopted all four levels and one of the four sub-constructs – Physical Resources. For any given instruction, the eventual goal would be to achieve level four for any sub-constructs applied. The profile of the capacity to support innovation guided me in the analysis of how TTIs and schools made use of physical resources – demonstrated in what was practised on the ground – as PSTs were prepared to teach and integrate ESE into their curriculum planning and teaching practices. This theory provided guidelines to help analyse the factors – at TTIs and primary schools – that enhanced or hindered the attempts to integrate ESE into what was practised. Lelliott *et al.* (2009) applied Rogan and Grayson's (2003) Theory of Curriculum Implementation and found that there was a disconnection between policy and what was implemented. Carl (2010) warns, 'Many curriculum initiatives have miscarried because curriculum developers underestimated the importance of implementation...The real success is evaluated by the degree to which it is workable in practice' (Carl, 2010:137).

For both institutions TA and TE, the capacity to support innovations to help integrate ESE into their curriculum planning and teaching practices as they prepared PSTs to teach and integrate ESE into their curriculum planning and teaching practices was graded at level 4, suggesting that the institutions had excellent buildings, one or more well equipped science laboratory, library or resource centre, adequate curriculum materials other than textbooks, good teaching and learning resources (for example, computers, models), attractive grounds and good copying facilities. For both primary schools P1 and P2, the capacity to support innovations as they contributed to teaching practice was graded at level 2 implying that the primary schools had adequate basic

buildings in good condition; suitable furniture which is adequate and in good condition; electricity in at least one room; textbooks for all and some apparatus for science.

According to Rogan and Grayson (2003), education institutions have different capacities for implementing innovations and for this study, the sub construct – physical resources within the profile of the capacity to support innovation is a possible indicator and influencing factor representing a progression with level 4 having indicators for the best operational features (*cf.* 3.2.3). Samples of photographs showing the physical grounds are shown in Appendix L

5.3.6 Observation of Practices Data

As earlier explained in Section 4.4.2.4 of this study, I conducted spontaneous, non-participant direct observations and gathered data in form of written field notes as well as digital photographs that did not include images of people. The labelled digital photographs (Appendix L) present a glimpse of what is practised in the four education contexts that provided valuable data for this study. For both institutions' TA and TE, the awarded level 4 mentioned in Section 5.3.5 corresponds to observed pro-environmental practices such as the excellent buildings which are surrounded by well-kept attractive grounds – that at institution TA had been partly converted into a living laboratory, (refer to Appendix L Photograph 04). In other words, there had been an attempt to turn the physical grounds into curriculum tools to complement textbooks, lesson outlines and other teaching and learning resources such as, among others, computer and library services. For the primary schools P1 and P2 that were awarded level 2 (*cf.* 5.3.5) for the availability of physical resources, the adequate basic buildings were in good condition and were surrounded by neat grounds (refer to Appendix L Photographs 01 and 02). The well-kept attractive grounds in the four institutions are a reflection of practices relating to sustainability and the environment in that as the labelled photographs indicate (refer to Appendix L Photographs 08, 12 and 13), the institutions were practising rubbish collection, planting trees, recycling biodegradable rubbish and proper disposal of non-biodegradable waste. It should be pointed out that the process of educating people on best practices in relation to sustainability and the environment was a protracted one. For example, lecturer T5 during the interview lamented that eliminating habits such as burning grass and raked leaves was proving

very difficult because the support staff found it a user-friendly approach to keep the compound clean.

5.4   DATA INTERPRETATION

In this section, I present the interpretation of the data that I collected for this study following the order in which data analysis was presented in Section 5.3 of this study. In Table 5.38, the sequencing of how collected data were presented for analysis is indicated and the corresponding paragraph where the analysis was done for convenient referencing by the reader if and when necessary is provided.

Table 5.38: Sequencing how data were presented for analysis

Data Collection Method	Data Presented for Analysis	Data Analysis Section
Survey using Questionnaire	Descriptive and inferential statistics analysis figures	5.3.1
Semi-structured face-to-face and online interviews	Interview Data. Categories and Themes	5.3.2
Document analysis	Documentary data in ORF, PRF and RF	5.3.3
Lesson observations	Lesson observation data	5.3.4
Field observations	Field observation data	5.3.5
Observation of practices	Observation of practices data	5.3.6

(Source: Compiled by the researcher)

Having applied what Leavy (2017) refers to as the convergent parallel or integrative design (*cf*.1.7.1.2), the analysed results have been interpreted together using simultaneous integration to develop integrated results and interpretations that according to Creswell and Clark (2018) expand understanding within the research task to provide comprehensive results. By linking the major findings into a coherent picture, I was able to establish – in line with the objectives of this study – the extent to which TTIs in Eswatini prepared PSTs for teaching and integrating ESE into their curriculum planning and teaching practices.

5.4.1 The extent to which ESE knowledge, skills and pro-environmental attitudes occur in the curricula of TTIs

In Section 5.3.1, it was stated that the combined mean score for knowledge on ESE in institutions TA and TE was 61.7% and the mean score for prevalence of pro-environmental attitudes was 41.8%. This is an indication that there is a fair amount of knowledge on ESE issues among PSTs, a fact that is further confirmed by the symmetrical normal distribution curve of that knowledge (*cf*. Figure 5.8). Pro-environmental sustainability attitudes are fairly prevalent though at a mean score value

less than 50%. This mean value is low partly because negative attitude scores were recorded among PSTs of institution TE. According to the inferential statistics results presented in Section 5.3.1, it was found that the distribution of knowledge on ESE issues was not influenced by gender, age, region where PSTs originated, location of residence or year of study. If the year of study did not influence knowledge on ESE matters, it could suggest that any possible ESE input into the PSTs curriculum practices was not having a reasonable impact on PSTs' levels of knowledge on ESE issues as they progressed from year one to year three. Similarly, the prevalence of pro-environmental attitudes was not influenced by gender, age, region where PSTs originated, location of residence or year of study.

The Chi-square test results on the relationship between knowledge on ESE matters and the prevalence of pro-environmental attitudes indicated a statistically significant association between the two realities as they existed among PSTs being prepared to teach and integrate ESE into their curriculum planning and teaching practices. The descriptive data confirms this fact in that where there was more knowledge, the score for the prevalence of pro-environmental attitudes was also higher. The content of teacher training curricula must be understood in the context of what curriculum is. According to Carl (2010), a curriculum is both a process and a product, the way in which educational aims are realised in practice that translates into the sum total of the means by which students are guided through learning experiences that in most cases are formally planned for them. Carl (2010) adds that the curriculum helps to fashion the user by unlocking his or her potential and as a pedagogic tool, it is not just the content but also the programme of planned activities and specific learning results that are part of what is experienced.

Documentary data analysis results presented in Section 5.3.3.1.6 of this study indicate that the ORF texts used by institutions TA and TE had reasonable levels of ESE integration meaning that ESE integration is not only supported officially by EMoET that regulates the functions of institution TE, but also the administrative structures that regulate the functions of institution TA. The PRF texts of institutions TA and TE – that in this study were course outlines used by lecturers to prepare PSTs – were judged to have very weak integration of ESE matters. Again, lesson observation data (*cf.* 5.3.4) analysis results indicated that all four PSTs that participated in this study demonstrated very weak integration of ESE matters into their teaching practice tasks. Putting all the

above observed facts together, it can be interpreted that not much of the content of teacher training curricula relates to ESE knowledge and skills as demonstrated during teaching practice. In addition, the inclusion of pro-environmental attitudes to promote sustainable behaviour among PSTs is not explicitly indicated within curriculum practices of institutions TA and TE.

5.4.2 The extent to which targets 4.7 and 4c of SDG 4 are integrated into the TTI curriculum texts and practices

The interview data analysis results presented in Section 5.3.2 indicate that three themes emerged out of the different categories that were identified from the 15 interviews conducted in this study. The 15th interview yielded no data because it was terminated within the first minute of its commencement. In Theme two, 'interfacing SDG 4, targets 4.7 and 4c with TTI curriculum practices', it emerged that individual knowledge on SDGs was not only lacking among PSTs, but also among lecturers with some clearly stating that they were not conversant with SDGs and did not know how to deal with them. There was also a lack of practically lived SDG based experiences, a setback to ESE integration that was further exacerbated by a lack of specific policy guidelines and agency for SDG integration. The analysis data described above should be interpreted to mean that targets 4.7 and 4c of SDG 4 were not well integrated into TTI curriculum practices. However, as earlier explained in Section 5.3.3, the ORF text produced by the education sector of UNESCO (*cf.* 5.3.3.1.3) was judged to have very strong ESE integration in all its sections and was also the only text that had content explicitly mentioning SDG 4 targets 4.7 and 4c. Overall, it is clear that targets 4.7 and 4c of SDG 4 are, to a very limited extent, integrated into the TTI curriculum texts and practices.

5.4.3 The mediation of ESE in TTIs during the training of PSTs

The mediation of ESE into TTIs as PSTs are prepared to teach and integrate ESE into their curriculum planning and teaching practices is closely tied to the general curriculum practices seen through the lens of the set of definitions of the term 'curriculum' (*cf.* 3.3.1). The interview data analysis results highlighting experiences of PSTs and lecturers revealed categories that gave rise to the theme 'ESE mediation experiences'. The effective mediation of ESE was considered to have been compromised by the preferred mode of teaching – the lecture method – which deviated

from approaches – characterised by learner-centred, learning-led curriculum engagements that O'Donoghue *et al.* (2018) recommend. The mediation experiences at institutions TA and TE lacked adequate support of online educational platform services. Additionally, ESE mediation experiences that utilised physical structures and grounds was carried out in a limited way because – as pointed out by PSTs – most were taught without any meaningful engagement in practical activities. Physical structures and grounds were not contributing much to the integration of ESE into PST curriculum practices even though field observation data (*cf.* 5.3.5) indicated that for both institutions TA and TE, the capacity to support innovations to integrate ESE into their curriculum planning and teaching practices was shown to be adequate. This means that even though the capacity exists, there is little or no practical implementation of ideas to improve the mediation of ESE in TTIs during the training of PSTs using physical structures and grounds. Data from observation of practices confirms this in that the excellent buildings surrounded by well-kept attractive grounds were for a long while not utilised as curriculum devices. Only recently has there been an attempt to do so in institution TA where they introduced a botanical garden (refer to Appendix L Photograph 04) to mediate ESE by using an approach that is expected to promote transformative teaching and learning.

In conclusion, the data analysis results reveal that ESE in institutions TA and TE was not properly mediated to prepare PSTs to teach and integrate ESE into their curriculum planning and teaching practices.

5.4.4 Factors enhancing or bridling the integration of ESE during PST training at TTIs

The discussion relating to the data analysis results indicates that some factors enhance while others restrict efforts to integrate ESE into the practices of institutions TA and TE. Documentary data analysis showed that whereas officials promoted the inclusion of ESE in curriculum texts, the PRF curriculum practices had not indicated that there was sufficient integration of ESE into curriculum practices at this level of curriculum implementation. On a more serious note, the analysis of the extent of ESE integration in the RF texts of institutions TA and TE, revealed that the overall integration of ESE in the teaching practice curriculum texts of PSTs was very weak. This suggests a possible lack of quality in the way PSTs are prepared to teach and integrate ESE into their curriculum planning and teaching practices. Observation of

practices to discover the extent of support for ESE integration also revealed that most of the time, PSTs did not engage in any practical activities that involved ESE partly because they were not exposed to such experiential opportunities in the TTI curriculum practices where they were training.

What stood out in the interview data analysis results was the fact that there is reasonable support for effective ESE integration into TTI curriculum practices. There is human resource capacitation at institutions TA and TE where the promotion of participation and ownership of the ESE integration process is emphasised. Support is seen through more specialised approaches to ESE mediation, especially one of creating a standalone ESE learning programme in form of a module where there is explicit inclusion of components that promote indigenous knowledge systems. The fact that 100% of interviewed participants recommended having such a standalone module, suggests that there is willingness to try other workable alternatives that could promote the process of preparing PSTs to teach and integrate ESE into their curriculum planning and teaching practices.

5.4.5 Integrating ESE into curriculum planning and lesson presentation during PSTs teaching practice

As explained in Section 5.3.4, lessons were observed for four of the PSTs who took part in this study. The overall analysis results, which show that there was very weak ESE integration with little or no explicit references to ESE, indicate that a very strong isolation exists between the lessons taught by PSTs and ESE matters. This confirms what was indicated that the overall integration of ESE into the teaching practice curriculum texts was judged to be very weak. The analysis results on what takes place during PSTs' teaching practice reveal that there is very little or no integration of ESE into the curriculum planning and lesson preparation and presentation during teaching practice. This also suggests that teaching practice – contrary to what two interviewed lecturers said – does not necessarily benefit PSTs as far as acquiring knowledge, skills and attitudes needed to teach and integrate ESE effectively is concerned.

5.4.6 Applying ESE knowledge, skills and attitudes acquired in TTIs in Eswatini by PSTs in their curriculum practices

Curriculum practices – as suggested in Section 5.4.1 – should be lived experiences by PSTs in their professional spaces that Carl (2010) also referred to as specific

learning results which in this study were sought through the five data collection methods presented in Table 5.38. PSTs apply what they acquire from their teacher training in the reproduction field that in this study was investigated through the analysis of data collected through a survey, interviews, document analysis, lesson observations, field observations and observation of practices. All PSTs interviewed expressed their dissatisfaction regarding the extent to which ESE matters were included in their curriculum documents and further lamented the lack of practical experiences during their training. They were not able to integrate ESE issues during teaching practice and did not hide the fact that they were not doing much as individuals in areas of extra-curricular activities linked to ESE.

The above interpretation points to the fact that PSTs have not been able to adequately apply ESE knowledge, skills and attitudes in their curriculum practices. The mean score values of 61.7% and 41.8% for knowledge on ESE issues and the prevalence of pro-environmental attitudes respectively emerging from the survey potentially suggest a need to improve on the knowledge levels for all PSTs and to positively influence their pro-environmental attitudes through what is practised in different areas in the curriculum reproduction field.

5.5   CHAPTER SUMMARY

In this chapter, I presented data from survey questionnaires, semi-structured interviews, document analysis, lesson observations, field observations and observation of practices. The results from the survey showed that among PSTs, there was a fair amount of knowledge on ESE issues that was normally distributed within the sample used in this study. The existence of knowledge on ESE issues was not associated with PSTs gender, age, region of origin, location of residence or year of study. The prevalence of pro-environmental attitudes identified to be of moderate levels, was independent of PSTs' gender, age, region of origin, location of residence or year of study. It was discovered that there was a statistically significant level of association between knowledge on ESE issues and the prevalence of pro-environmental attitudes among PSTs. The results from the analysis of official curriculum documents revealed that the attempt by EMoET and UNESCO to integrate ESE into curriculum documents was neither reciprocated by lecturers in their curriculum texts, nor the PSTs that the lecturers prepare to become teachers.

Furthermore, the results from the analysis of the lessons that were observed showed very weak ESE integration in what PSTs taught during the lessons. Three themes emerged out of the responses from the semi-structured interviews that were conducted. The themes are ESE mediation experiences; interfacing SDG 4 target 4.7 and 4c with TTI curriculum practices; and support for effective ESE integration into TTI curriculum practices. Even though the field observation data revealed that PSTs' living environment was characterised by excellent buildings with well-kept grounds and surroundings, the observation of practices indicated that the physical structures were not used to mediate ESE. In the next chapter, I draw conclusions and offer recommendations based on the findings just presented and I also present my proposed framework for effective preparation of PSTs for teaching and integrating ESE into their curriculum planning and teaching practices.

CHAPTER SIX
SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

6.1   INTRODUCTION

This study set out to investigate the extent to which PSTs were being prepared to integrate ESE knowledge, skills and attitudes into Eswatini school curriculum with the aim of gaining a better understanding of the extent to which TTIs in Eswatini support the integration of ESE into teacher education curriculum practices. In the previous chapter, I presented findings of my research; in this chapter I provide a synopsis of the study including the research aim and objectives, contextual, theoretical and conceptual frameworks. The chapter also presents a summary of the study findings in the form of research conclusions and recommendations. Additionally, using the study findings, the study's major contributions are highlighted. They include a suggested implementation framework for integrating ESE into TTI curriculum practices. Finally, avenues for further research are suggested, limitations encountered in the study are given and a reflection on the researcher's personal experience is presented.

6.2   SUMMARY OF RESEARCH FINDINGS

In this study, I aimed to answer the research question: *To what extent are pre-service teachers being prepared to integrate Environmental and Sustainability Education knowledge, skills, and attitudes into the Eswatini school curriculum?*

In order to answer the question, I selected two TTIs and two schools where I conducted investigations using the instrumental multisite case study research type. All the four cases are located in Manzini Region in the Kingdom of Eswatini.

I followed a MMR approach and used a convergent parallel design. I began by conducting a literature study in order to shed light on local and global practices that highlight approaches to the integration of ESE into HEIs' curriculum practices and to align aspects of the 2030 UNGA.

Data were collected using a survey questionnaire and descriptive information collection methods meaning that the data collection tools that I used consisted of not only a structured questionnaire made up of closed-ended questions, but also interview schedules, teaching practice lesson observation schedules, physical grounds

observation schedules and observing what was practised. The questionnaire was completed by 211 respondents while interviews were conducted with 15 purposively sampled participants. The rest of the qualitative data were collected from the two TTIs and the two schools that took part in this study. For data analysis, the side-by-side comparison approach was applied by analysing the quantitative statistical results using descriptive statistics and inferential tests of relationships as well as the analysis of qualitative themes and other text data in the form of non-numerical assessment of observations which help to understand people and situations being investigated. The findings that were analysed and interpreted responded to the research question and sub-questions of the study.

As outlined in Section 1.6, the study had six objectives and six research questions to help achieve the six objectives which were to:

1. To establish what scholarly literature says regarding pre-service teacher training in Environmental and Sustainability Education knowledge, skills, and attitudes in the school curriculum.
2. To evaluate the extent to which targets 4.7 and 4c of Sustainable Development Goal 4 are integrated into the teacher training institutions' curriculum.
3. To explore how Environmental and Sustainability Education is mediated in teacher training institutions during the training of pre-service teachers.
4. To identify the underlying factors enhancing or hindering the integration of Environmental and Sustainability Education during pre-service teacher training at teacher training institutions.
5. To assess how pre-service teachers integrate Environmental and Sustainability Education in their curriculum implementation practices in the classroom.
6. To propose a framework which could be employed by teacher training institutions to enhance Environmental and Sustainability Education knowledge, skills, and attitudes in the school curriculum.

The process of curriculum document analysis which was explained in Section 4.4.2.2 of this study addressed research sub-question one. Research sub-questions two, three and four were respectively addressed by Themes two, one and three that emerged from the semi-structured interviews. The findings from teaching practice observations addressed sub-questions five and six. The findings from the

survey provided the foundation to address sub-question six because the numerical data not only revealed the extent to which PSTs were knowledgeable on ESE issues but also the level of prevalence of pro-environmental attitudes, that is, the knowledge, skills and attitudes acquired during their training at TTIs.

6.2.1 Key Scholarly Review Findings

The contextual framework for this study discussed in Chapter Two, was founded on the assumption that the value and quality of ESE in HEI can be strengthened by giving closer attention to ESE practices as PSTs are trained to become teachers. In that framework, I shed light on practices highlighting approaches to the integration of ESE into TTIs' curriculum practices and how the 2030 UNGA was aligned with this study. The historical roots of EE and ESD which constitute the ESE construct were presented to help bring clarity to the collective name of ESE in such a way that curriculum integration at a global and local level focusing on ESE integration into HE curriculum practices would be understood. ESE mediation which, according to Mahmud (2017), translates into a learning process and approach to a form of teaching that is grounded on the ideals and principles that underlie sustainability and which formed a key component in the literature that was reviewed (*cf*. 2.1). The literature further highlighted the preparation of PSTs in TTIs as practices of how knowledge was constructed to effectively teach for sustainability were explored. The PSTs were presented as individuals who required transformation in order to become well-prepared change agents, capable of teaching and learning for sustainability. Part of the contextual framework for this study presented the SDGs discourse in teacher education and training as vital CK to ESE integration.

The theoretical and conceptual frameworks that underpinned this study were discussed in Chapter Three. The three theories that I applied in this study consisted of: Constructivist theories of learning; Bernstein's concepts of Classification, Framing and Curriculum Recontextualisation; and Rogan and Grayson's Theory of Curriculum Implementation (*cf*. 3.2). The three theories provided a lens through which the development of ESE knowledge, skills and attitudes could be accounted for as well as providing the guidelines for designing frameworks that were used to analyse findings. The theory of constructivism emphasises that people experientially construct knowledge and their own understanding of the world around them. Avery and Nordén

(2017) mentioned intellectual pluralism and Qablan (2018) suggested redirecting pedagogical approaches by replacing traditional curriculum practices whose characteristics are listed in Table 3.1 (*cf.* 3.2.1.5).

Having used constructivism as a theoretical lens to explore how ESE knowledge, skills and attitudes were acquired by PSTs in TTIs as they were prepared to teach and integrate ESE into their curriculum planning and teaching practices, it is clear from my findings that PSTs to a minor extent, have applied constructivist principles in their curriculum planning and teaching practices.

Bernstein's concepts of classification, framing and knowledge recontextualisation provided tools of analysing and describing educational processes at three major curriculum fields (Bernstein, 1990). The aspect on knowledge recontextualisation provided a standpoint to understand and explain what took place in the three fields of curriculum recontextualisation as knowledge was transformed between sites where it was constructed. The constructivist approach to learning (*cf.* 3.2.1) identifies with the pedagogic mode of social organisation where, according to Ivinson and Duveen (2006), knowledge is negotiated in context (*cf.* 3.2.2.3). Bernstein's concept of classification provided the means by which I not only analysed the extent of integration of ESE into different curriculum texts, but also the analysis of lessons taught by PSTs. The analytical tools that were designed provided a better form of interpretation to the analysis process. Bernstein's concept of Framing provided the means by which I analysed the degree of control teachers and learners possessed over what was taught in the classroom.

Rogan and Grayson's Theory of Curriculum Implementation provided the means by which I collected and analysed field observation data as I utilised the construct 'capacity to support innovation'. From their framework, I adopted all the four levels (refer to Table 5.37) and one of the four sub-constructs – physical resources. With this theory, I was able to analyse the factors at TTIs and schools that enhanced or hindered the integration of ESE into what was being practised. The capacity to support innovations that promote the integration of ESE into curriculum planning and teaching practices of the two TTIs was graded at Level 4 and for the two schools, the capacity to support innovations was graded at Level 2.

The conceptual framework that highlights the relationship between the four concepts shaping this study was presented in Section 3.3. The key concepts in the study were ESE, Curriculum Integration, Pre-service Teacher Education and Training and SCs. The study set out to explore educational realities about ESE in TTIs in Eswatini in the area of curriculum practices so as to be able to determine the extent to which PSTs were being prepared to integrate ESE knowledge, skills and attitudes into the Eswatini school curriculum resulting in PSTs developing SCs to integrate ESE into their curriculum planning and teaching practices.

6.2.2 Key Empirical Findings

The key empirical findings are summarised here under the headings: survey results, documentary and lesson observation data, interview data and physical structures observation and observation of practices in them.

6.2.2.1 Survey results

Results from the survey carried out in institutions TA and TE in this study showed the combined mean score of 61.7% for knowledge on ESE matters and the mean score of 41.8 % for the prevalence of pro-environmental attitudes (*cf*. 5.4.1). This was a measure of the extent to which ESE knowledge and pro-environmental attitudes occurred in the curricula of TTIs. The figures indicated that the distribution of knowledge on ESE issues – which according to data analysed was not influenced by gender, age, regional location, location of residence or year of study – was regarded to be at a medium level. The distribution of pro-environmental attitudes on the other hand was seen to be at a lower level. The results also indicated that the two realities – knowledge on ESE matters and the prevalence of pro-environmental attitudes – were closely associated with each other; that is, in the life of PSTs, they both influenced the extent to which ESE knowledge, skills and pro-environmental attitudes were integrated into curriculum practices.

6.2.2.2 Documentary and lesson observation data combining three recontextualisation fields

Documentary data analysis results indicated that the ORF texts used by institutions TA and TE had reasonable levels of ESE integration. The PRF texts for the same institutions were judged to have very weak integration of ESE matters (*cf*. 5.3.3).

Lesson observation data results indicated that all four PSTs that participated in this study showed very weak integration of ESE matters into their teaching practices – a curriculum reproduction field. From analysing data for lesson observation, it is clear that ESE knowledge, skills and attitudes have not been adequately integrated into PST curriculum planning and teaching practices. Results from this study indicate a definite weakening of how ESE is handled as its discourse progresses from the ORF to the PRF before reaching the RF meaning that whereas the EMoET is endeavouring to produce ESE curriculum texts, lecturers and PSTs are not effectively converting it to PCK.

The analysed and interpreted data do not show to any reasonable extent PSTs engaging in interpreting the world as a way of constructing knowledge through active processes that Driscoll (2014) and Woolfolk (2016) refer to as co-creation of meanings (*cf.* 3.2.1). The research findings which were analysed and interpreted highlight a lack of co-creation of meanings in settings that promote problem solving, the use of complex, relevant and realistic environments, socially negotiated learning in contexts that have multiple perspectives and multiple modes of learning. The process of transitioning from transmissive teaching models to constructivist transformative learning processes could not be identified in the different cases that were investigated in this study, implying that TTIs in Eswatini only to a little or even to no extent apply constructivist principles to prepare PSTs for teaching and integrating ESE into their curriculum planning and teaching practices. The conditions for learning construction sites which should include complex, relevant and realistic environments that promote socially negotiated learning are absent. Also missing are the other elements of constructivist methods of instruction which, according to Driscoll (2014), include – among others – collaborative learning, problem scaffolding, goal-based scenarios, problem-based learning, discovery and exploration (*cf.* Figure 3.3).

The strong framing that was discovered during lesson observations (*cf.* 5.3.4.3) implies that learners have limited control over the way their knowledge is constructed during the mediation of ESE.

6.2.2.3 Interview data

Data collected through semi-structured interviews yielded three themes aligned with the research questions. The themes are ESE mediation experiences; interfacing SDG

4, targets 4.7 and 4c with TTI curriculum practices; and support for effective ESE integration into TTI curriculum practices (refer to Appendix J). It is evident from the empirical findings of this study that whereas ESE mediation experiences are varied, the experiences of PSTs and their lecturers are closely associated and to a large extent similar. Both PSTs and lecturers concur that ESE mediation is taking place, but the preparation of PSTs for teaching and integrating ESE into their curriculum planning and teaching practices needs to be adjusted to yield better results. Such adjustments would involve the creation of reliable online educational platform services. The lack of adequate SDG knowledge among PSTs and lecturers coupled with a lack of practically-lived SDG-infused experiences present interfacing SDG 4, targets 4.7 and 4c as a challenging task, which is made more difficult by a lack of policies – in the strategic planning frameworks of TTIs – that support agency for SDG integration. Interview participants felt that there was a lack of aligning institutional programmes with SDGs, a lack of explicit reference to SDGs and a lack of policies that promote agency. Support for effective ESE integration into TTI curriculum practices through capacitating human resource, promoting participation and ownership of ESE integration culminated in the proposal to create a standalone ESE subject that would utilise, among other components, IKS for effective ESE integration.

6.2.2.4   Physical structures observation and the practices taking place in them

The field observation data indicates that PSTs physical environments in institutions TA and TE are characterised by what Rogan and Grayson describe as excellent buildings with well-kept grounds and surroundings (*cf*. 5.3.5). However, due to the fact that most of the time, PSTs were taught inside classrooms and laboratories, the well-established structures and grounds were not contributing much to the integration of ESE into PST curriculum practices. For schools P1 and P2, the physical structures and grounds along with what was practised in them showed that the schools had adequate basic buildings which were in good condition and physical grounds which were kept clean (refer to Photographs, Appendix L).

6.3   RESEARCH CONCLUSIONS

The aim of this study was to discover the extent to which PSTs were being prepared to integrate ESE knowledge, skills and attitudes into the Eswatini school curriculum.

The scholarly literature and empirical study findings revealed a lot about ESE integration and the conclusions of my research based on the evidence produced in this study will be stated in form of answers to my initial research questions.

6.3.1 What does Scholarly Literature say regarding Pre-Service Teacher Training in Environmental and Sustainability Education Knowledge, Skills and Attitudes in the School Curriculum?

When one talks about school curriculum in relation to PSTs, recontextualisation comes to mind because what takes place in school curriculum settings as reproduction fields of curriculum texts that partly depend on the quality of practices in the PRF where PSTs are trained. Hart (2010) recommends that education curriculum programmes should be creating epistemic spaces to get the best out of educators at different levels of curriculum implementation (*cf*. 2.8.1).

Bernstein (1990) and Carl (2010) remind us that any relevant content material introduced in curriculum structures should yield interconnections characterised by common concepts, values and skills (*cf*. 5.3.2.1). PST training in ESE knowledge, skills and attitudes should be underpinned by research findings to guide the process of aligning curriculum content and curriculum assessment (Loubser, 2011) (*cf*. 2.8.1).

According to Sarıkaya and Saraç (2018), the development of pro-environmental values and attitudes enhances the teaching and learning of environmental issues, as such experiential learning encounters should be promoted (*cf*. 2.7.2). Sánchez *et al.* (s.a.) add that incorporating sustainability ideas into the policies, planning and administration of HEIs would foster the co-creation of knowledge as part of curriculum development because key stakeholders would be encouraged to participate in multiple perspectives of content as environmental, social and economic dimensions of life are tackled (Boeve-de Pauw *et al.* (2015) (*cf*. 2.8.1).

More than a decade ago, Johnston (2009) argued that the curriculum process was too slow to bring about change because policies that did not support transformative sustainability curriculum initiatives were in place. O'Donoghue *et al.* (2018) later cautioned that as a learning process and approach, ESE should be mediated in modes that are learner-centred and learning-led curriculum engagements (*cf*. 2.6.1). It is these alternative transformative curriculum practices that PSTs in the PRF introduce in school curriculum programmes where they are posted to serve teachers.

Ultimately, as pointed out by Nazarenko and Kolesnik (2018), PST training should ensure that the level of environmental knowledge is raised among PSTs so that their cognitive processes are awakened and environmental awareness promoted in such a way that interest is raised to participate in environmental activities among PSTs and the learners with whom they interact (*cf.* 2.4.1). It is such curricula and pedagogy that will give PSTs and the learners they teach in schools the knowledge, skills and attitudes to help develop SCs.

6.3.2 To what extent are Targets 4.7 and 4c of Sustainable Development Goal 4 integrated into the Teacher Training Institutions curriculum?

The extent to which targets 4.7 and 4c of SDG 4 are integrated into the TTIs curriculum practices was revealed when it emerged that among PSTs and their lecturers, individual SDG knowledge was lacking with little or no practically-lived SDG experiences. This means that to a very minor extent, targets 4.7 and 4c of SDG 4 are integrated into the TTIs curriculum practices.

6.3.3 How is Environmental and Sustainability Education mediated in Teacher Training Institutions during the training of Pre-service Teachers?

The answer to this question was based on both the literature study and the empirical study findings for this study. Effective ESE mediation has been compromised by excessive reliance on the lecture method which deviates from approaches characterised by learner-centred, learning-led curriculum immersions recommended by, among others, O'Donoghue *et al.* (2018) (*cf.* 2.6.1). The ESE mediation observed in this study lacked adequate support from online educational platform services. With predominantly lecture methods that lack meaningful engagement in practical activities, ESE mediation does not take place using physical structures and grounds. The overall conclusion is that in TTIs during the training of pre-service teachers, ESE is not mediated using ways that are highlighted as being effective.

6.3.4 What are the Factors at Teacher Training Institutions that enhance and/or hinder the Integration of Environmental and Sustainability Education Knowledge, Skills and Attitudes during Pre-service Teachers' training?

The integration of ESE during PSTs' training at TTIs is enhanced by reasonably good support in the form of human resource capacitation by TTI leaders who promote participation and ownership of ESE integration processes. Hindrances to integrating

ESE during PSTs' training include the overall lack of quality ESE teaching characterised by the lack of practical activities. The disconnection between ORF and PRF curriculum texts where it was observed that in the PRF there was no sufficient implementation of what was prescribed in the ORF texts is partly due to a lack of guidelines on how ESE should be mediated.

6.3.5 How do Pre-service Teachers integrate Environmental and Sustainability Education into their Curriculum Planning and Lesson Presentation in the Classroom during Teaching Practice?

There was very weak integration of ESE into curriculum planning and lesson presentation during teaching practice as it was observed that little or no explicit references to ESE were made, meaning that a very strong isolation existed between the lessons taught and ESE matters. These results lead to the conclusion that teaching practice may not always benefit PSTs as far as acquiring knowledge, skills and attitudes needed to effectively teach and integrate ESE is concerned.

PSTs apply what they acquire from their training in what Bernstein (1990) refers to as curriculum reproduction fields (*cf.* 3.2.2). The dissatisfaction expressed by PSTs regarding the extent to which ESE matters were included in their curriculum practices suggests that they had not acquired sufficient ESE content and, as such, had little to apply in their practices. The PSTs that were observed and interviewed were unable to integrate ESE issues during teaching practice and explicitly expressed their lack of willingness to engage in areas of extra-curricular activities linked to ESE.

6.3.6 What Framework could be employed by Teacher Training Institutions to Enhance Environmental and Sustainability Education Knowledge, Skills and Attitudes in the School Curriculum?

A framework that could be employed by teacher training institutions to enhance ESE knowledge, skills and attitudes in school curriculum should focus on adequately preparing PSTs throughout their three years of training. A proposed framework is shown in Figure 6.1 and explained in Section 6.4.1.

6.3.7 Main Research Conclusion

Considering the amount of content of teacher training curricular linked to ESE, the extent to which targets 4.7 and 4c of SDG 4 are integrated into TTIs curriculum practices, the way ESE is mediated and the amount of ESE knowledge, skills and pro-

environmental attitudes that are acquired and are applied by PSTs in their curriculum practices, the study findings lead to the conclusion that PSTs only to a minor extent are being prepared to integrate ESE knowledge, skills and attitudes into the Eswatini school curriculum.

6.4   RECOMMENDATIONS

The overriding goal of this study was to analyse the extent to which PSTs in TTIs in Eswatini were being prepared for the integration of ESE into teacher education curriculum practices. As indicated in Section 6.3.7, it was discovered that the TTIs to a very minor extent are helping to prepare PSTs for teaching and integrating ESE into their curriculum planning and teaching practices. There is therefore urgent need for intervention to improve the situation on ESE integration into TTI curriculum practices. The recommendations of the study focus on seven aspects.

6.4.1 Proposed Implementation Framework

Recommendation 01

The first recommendation for an improved approach to ESE mediation is based on the empirical findings that are also supported by findings based on the reviewed literature carried out in this study. It is recommended that TTIs should adopt a two-phase implementation framework for effective ESE integration into TTI curriculum practices (refer to Figure 6.1).
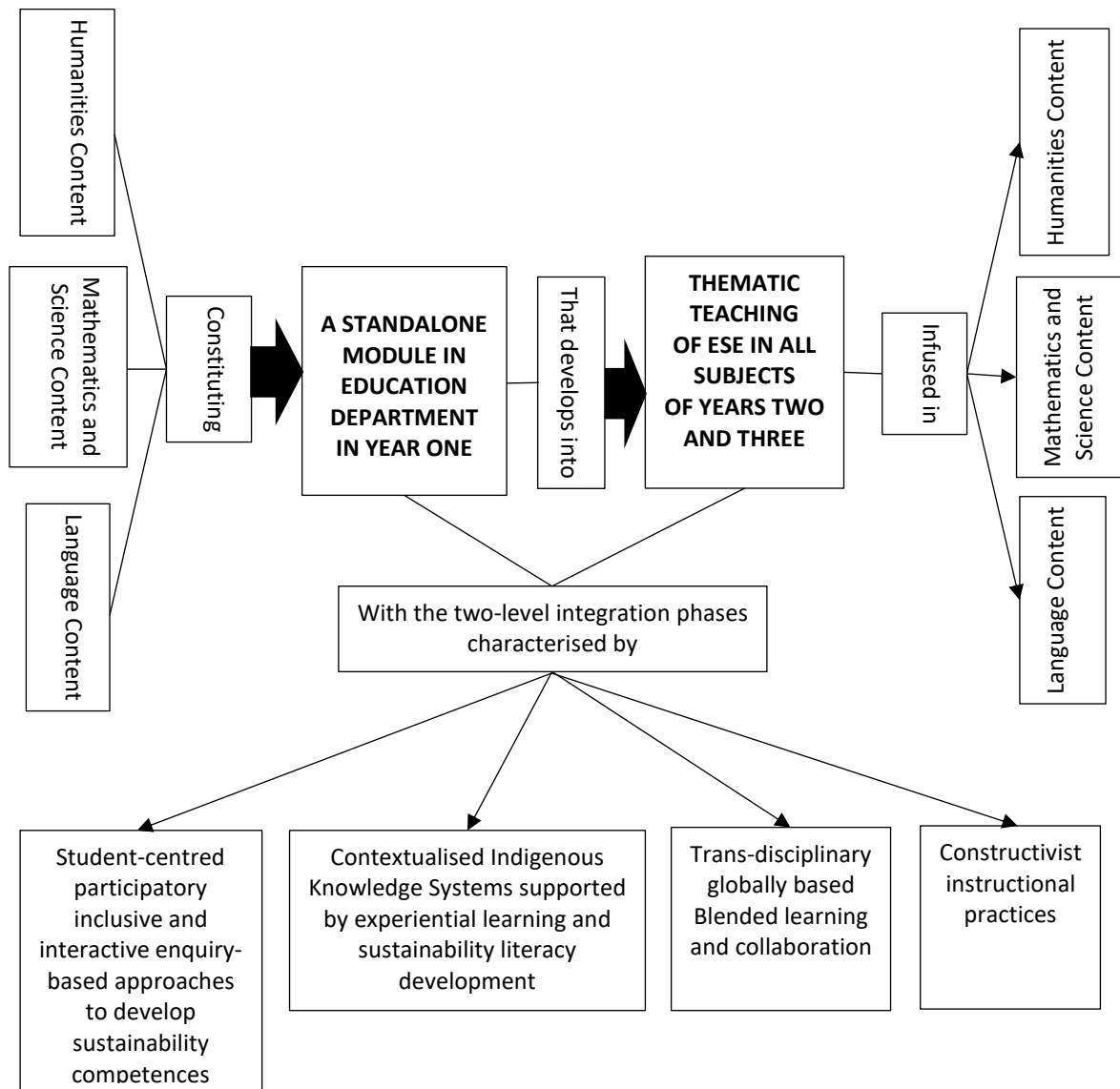
(Source: Compiled by researcher)

Figure 6.1: Integrating ESE into Teacher Training Institution Curriculum Practices: A two phase Implementation Framework

As indicated in the framework, a standalone ESE module supervised by the EMoET should be designed for year one PSTs where the content is gathered from all subject areas, that is, Humanities, Languages, Science and Mathematics. As the PSTs in year one progress to the next academic levels, thematic teaching of ESE will be infused into all subject areas where the two-level integration phases will be characterised by teaching and learning approaches that apply constructivist instructional curriculum practices in student-centred and enquiry-based contexts. These curriculum practices

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would in part utilise IKS in settings that are not just collaborative, but also able to offer blended learning at a local and global scale.

6.4.2 Governance level

Recommendation 02

The ORF pedagogic texts linked to ESE should receive more exposure as well as recognition; moreover, EMoET officials should follow up their integration into TTI curriculum practices. Therefore, there should be closer collaboration between EMoET officials and TTI leaders who guide activities in the PRF curriculum texts that were discovered to have very little ESE integration.

Recommendation 03

There is need to strengthen the working relationship between EMoET and the Ministry of Tourism and Environmental Affairs where organisations that promote ESE matters are operationalised. Such organisations that include MESA and EEA, should offer technical support in the production of educational materials for effective ESE implementation, which is proposed in Section 6.4.1. The production of such curriculum texts would make it easier to share the message of ESE integration with TTI leaders, lecturers and other stakeholders such as the ESD for 2030 in-country initiative committee based at EMoET.

Recommendation 04

The analysis of the extent of ESE integration into curriculum planning and lesson presentation by PSTs revealed very little ESE integration in whatever was taught and yet the TTIs and schools had facilities that were judged as being able to support effective ESE mediation. Based on these findings, I recommend that within the TTI administrative structures, a committee be established to raise awareness about ESE matters as part of curriculum development efforts in TTIs. Such a committee should recommend how lecturers and PSTs can be helped to deal with ESE issues in their curriculum spaces. The committee should work closely with organisations such as MESA and EEA to ensure that TTIs participate in programmes that support ESE efforts at a national level. As illustrated in Figure 6.1, both the high degree of autonomy by lecturers and the thick subject boundary insulations need to be reduced in order to promote transdisciplinarity.

6.4.3 Institutional level

Recommendation 05

The status of the 2030 UNGA in TTI curriculum practices should be strengthened and explicitly included in TTI curriculum texts to help attain the SDGs and any other global agenda that follows. This would require EMoET curriculum officials receiving more training in ESE matters, especially in the way ESE content is infused into the ENETSP texts.

Recommendation 06

I recommend that more ESE curriculum texts of improved quality be made available to TTIs in support of the two-phase approach explained in Section 6.4.1

6.4.4 Stakeholder level

Recommendation 07

There is need for expanded collaboration with key stakeholders such as MESA and EEA, in order to promote and strengthen lifelong learning in ESE related matters. Such collaborative efforts would help lecturers to acquire more in-service training as part of their personal professional development.

6.5   AVENUES FOR FURTHER RESEARCH

As indicated in Section 1.1.2, the significance of this study is motivated by the limited information on how ESE issues have been integrated into the teacher education curriculum practices in Eswatini as PSTs are being prepared for the teaching profession. A focus of ESE in TTI curriculum practices is also capable of enhancing the relevance of the ongoing 2030 UNGA even as misconceptions about what sustainability is, are tackled. By investigating the extent to which PSTs were being prepared to integrate ESE knowledge, skills and attitudes into the Eswatini school curriculum, this study, has contributed to knowledge about ESE teaching and learning among PSTs. At the same time, the study has exposed knowledge gaps that need to be researched on in order to realise effective ESE integration into TTI curriculum practices.

The source of ESE knowledge that Bernstein (1990) referred to as the production field needs to be investigated so that knowledge, which is recontextualised in both the ORF

and the PRF and is later reproduced in the classroom, is clearly understood and better utilised. A better understanding of the context in which ESE knowledge is produced would lend support to efforts focusing on creating quality ESE PCK that would be mediated using the proposed two-phase implementation framework presented in Figure 6.1.

Research needs to be conducted on ORF texts that are released by international bodies and may not be easily accessed by educators such as lecturers in TTIs. An example of such a text is the Education for SDGs Learning Objectives that was produced in 2017 by UNESCO but may not have been promoted by the EMoET as a key curriculum text for ESE mediation. There is a need to establish how such important ESE curriculum texts are related to other ESE curriculum texts promoted by EMoET.

This study analysed the extent of ESE integration in only two TTIs and two schools. In order to get a broader view of the extent of ESE integration in HEIs across the entire Kingdom of Eswatini, it is necessary that this study be repeated to cover all TTIs in Eswatini. Furthermore, a survey covering the four regions of Eswatini should be carried out to obtain quantitative data that would help to reveal the statistical correlation between environmental and sustainability knowledge and attitudes of high school learners and HEI students in order to have a better picture of how ESE knowledge and pro-environmental attitudes develop in learners progressing from high school to tertiary institutions.

This study highlighted course outlines as key PRF curriculum texts that offer the foundation and guidelines to PST practices in the curriculum reproduction texts. The study showed that the extent to which ESE was integrated into course outlines was very weak. This result points to a need for further research on the production of PRF curriculum texts in TTIs with emphasis on investigating the role of institution leaders as quality control agents.

6.6   LIMITATIONS OF THE STUDY

Limitations are aspects of a study that decrease the generalisability of the findings and conclusions, aspects in a study that restrict the population to which findings can be generalised due to constraints that result from unanticipated challenges that emerge from the study (Gray, Grove & Sutherland, 2017).

The limitations of this study have been identified in the context of a MMR approach where both quantitative and qualitative data were collected, analysed and interpreted. Even though some researchers insist that the quantitative and qualitative approaches are incompatible as they have different conceptions of what reality is, the driving motive for combining the two approaches is the belief that both kinds of research have complementary value to each other as the mixing of methods informs the analysis and interpretation of data (Dawadi, Shrestha & Giri, 2021). Accordingly, the limitations of this study include the following:

- With regard to results based on the quantitative data that were collected for this study, the findings cannot be generalised to other TTIs and schools other than institutions TA and TE. The planned sample of 400 respondents was reduced to 211 due to circumstances beyond the researcher's control characterised by disruptions of semester activities due to prevailing circumstances in the time frame when data were being collected. In that time frame, students in the two TTIs where the study was conducted engaged in frequent class boycotts that always resulted in the closing of the institutions. It therefore became a problem to get the 400 respondents because the institutions – in such situations – would resort to utilising online learning platforms. The analysis of quantitative data proved expensive to purchase at the time as a result of requiring a recent version of the IBM SPSS statistical package to help with data analysis. However, I utilised the free offer by the IBM SPSS supplying company that lasted a few weeks meaning that I activated and used it within that short time frame as I saved money to purchase one later.

- Given the fact that this study dealt with only four cases, the two TTIs and two schools are not representative of all the TTIs and schools in the four regions of Eswatini. This again means that the qualitative data generated are not generalisable to the rest of the kingdom of Eswatini, even though other researchers conducting similar research may obtain useful ideas from inferences made in this study.

- Limitations of this study also concern aspects of qualitative data analysis based on Bernstein's concepts of classification and framing that guided the designing of analytical tools. The design of the tools did not consider the personal and social aspects of whatever was analysed, meaning that the analysis of lessons

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observed could be considered incomplete since that analysis only focused on the way curriculum matter was integrated with no consideration to personal aspects of PSTs and the learners whom they taught. Furthermore, the design of the analytical tools could not shed light on the quality of ESE knowledge which was being integrated.

- The lessons observed may not have represented a typical school lesson since prior arrangement with the teachers was made before visiting them. In all the four cases, the PSTs appeared to act out the lesson for me which suggests that my presence potentially affected the behaviour of the learners and PSTs even though I sat in an unobtrusive way.

- The interviews that I conducted with PSTs could have created some fear in them since, as their lecturer, some of my students may have created responses to please me; this may imply that data that emerged from interviews may not be a true reflection of the participants' experiences.

- As a lecturer with reasonable experience in a TTI, my personal professional knowledge partly influenced the way I carried out research procedures to collect, analyse and interpret data; that is, the way I analysed and interpreted curriculum texts and teaching practice activities. The way I selected interview questions for the seven interview schedules and the amount of probing I planned to carry out could have been influenced by what I already knew as a lecturer. To that effect, I reflected a lot on what I did to minimise such biases.

6.7 CONCLUDING REMARKS

Right from the beginning when I chose to engage in MMR because I needed to not only engage many PSTs through a survey, but also get narrative data through in-depth investigations, the focus has been on completing the research task with a proposed framework that I consider to be a suitable alternative to the process of integrating ESE into PSTs curriculum practices at TTIs. The research process became more meaningful once I decided to use the three theories that constituted the theoretical framework. Designing the questionnaire was a manageable task because by the time I started working on it, I had already decided that the quantitative data analysis would be computed using the IBM SPSS statistics programme. The reasonably good pace set at the beginning of the research journey was a result of

careful consideration and selection of methods and methodologies within which MMR methods thrive. This is the aspect that proved most formative to me as a researcher.

I nevertheless experienced a negative reaction from some PSTs who refused to complete the questionnaire even though they had received it willingly. The overall engagement with qualitative data collection went very well as data were collected with minimum disruptions.

Ultimately, the findings from the study highlighted the extent to which PSTs were being prepared to integrate ESE knowledge, skills and attitudes into the Eswatini school curriculum which resulted in the designing of the two-phase implementation framework for effective ESE integration into TTI curriculum practices which it is hoped will scaffold pre-service teachers in their training and offer them the knowledge and skills to move confidently into their teaching enacting the five critical dimensions of people, prosperity, planet, partnership and peace as proposed by UNGA 2030 .

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APPENDICES

Appendix A: Ethical clearance

UNISA | university of south africa

UNISA COLLEGE OF EDUCATION ETHICS REVIEW COMMITTEE

Date: 2021/06/09

Ref: **2021/06/09/33528985/12/AM**
Name: Mr JS Kyamogi
Student No.: 33528985

Dear Mr JS Kyamogi

Decision: Ethics Approval from
2021/06/09 to 2026/06/09

Researcher(s): Name: Mr JS Kyamogi
E-mail address: 33528985@mylife.unisa.ac.za
Telephone: +268 76080568

Supervisor(s): Name: Prof Ailwei Solomon Mawela
E-mail address: mawelas@unisa.ac.za
Telephone: 0764132156

Title of research:

Investigating pre-service teachers' integration of environmental and sustainability education knowledge, skills and attitudes in Eswatini school curriculum

Qualification: PhD Curriculum Studies

Thank you for the application for research ethics clearance by the UNISA College of Education Ethics Review Committee for the above mentioned research. Ethics approval is granted for the period 2021/06/09 to 2026/06/09.

The **medium risk** application was reviewed by the Ethics Review Committee on 2021/06/09 in compliance with the UNISA Policy on Research Ethics and the Standard Operating Procedure on Research Ethics Risk Assessment.

The proposed research may now commence with the provisions that:

1. The researcher will ensure that the research project adheres to the relevant guidelines set out in the Unisa Covid-19 position statement on research ethics attached.

2. The researcher(s) will ensure that the research project adheres to the values and principles expressed in the UNISA Policy on Research Ethics.

University of South Africa
Preller Street, Muckleneuk Ridge, City of Tshwane
PO Box 392 UNISA 0003 South Africa

3. Any adverse circumstance arising in the undertaking of the research project that is relevant to the ethicality of the study should be communicated in writing to the UNISA College of Education Ethics Review Committee.

4. The researcher(s) will conduct the study according to the methods and procedures set out in the approved application.

5. Any changes that can affect the study-related risks for the research participants, particularly in terms of assurances made with regards to the protection of participants' privacy and the confidentiality of the data, should be reported to the Committee in writing.

6. The researcher will ensure that the research project adheres to any applicable national legislation, professional codes of conduct, institutional guidelines and scientific standards relevant to the specific field of study. Adherence to the following South African legislation is important, if applicable: Protection of Personal Information Act, no 4 of 2013; Children's act no 38 of 2005 and the National Health Act, no 61 of 2003.

7. Only de-identified research data may be used for secondary research purposes in future on condition that the research objectives are similar to those of the original research. Secondary use of identifiable human research data requires additional ethics clearance.

8. No field work activities may continue after the expiry date **2026/06/09**. Submission of a completed research ethics progress report will constitute an application for renewal of Ethics Research Committee approval.

Note:

The reference number **2021/06/09/33528985/12/AM** should be clearly indicated on all forms of communication with the intended research participants, as well as with the Committee.

Kind regards,

Prof AT Motlhabane
CHAIRPERSON: CEDU RERC
motlhat@unisa.ac.za

Prof PM Sebate
EXECUTIVE DEAN
Sebatpm@unisa.ac.za

Approved - decision template – updated 16 Feb 2017

Appendix B: Request to conduct research

Letter to the Director of Education, Eswatini Ministry of Education and Training

June, 2021

The Director
Ministry of Education and Training
P. O. Box 39
Mbabane
Eswatini

Dear Madam

RE: Permission to conduct research at two Teacher Training Colleges and two Primary Schools.

Research Project Title: INVESTIGATING PRE-SERVICE TEACHERS' INTEGRATION OF ENVIRONMENTAL AND SUSTAINABILITY EDUCATION KNOWLEDGE, SKILLS AND ATTITUDES IN ESWATINI SCHOOL CURRICULUM

I am a lecturer at Southern Africa Nazarene University, Faculty of Education who is currently enrolled at the University of South Africa for a Doctor of Philosophy in Education degree focusing on curriculum studies.

I hereby request permission to conduct research at two Teacher Training Colleges and two Primary Schools in Eswatini. The two Teacher Training Colleges are: William Pitcher Teacher Training College and Ngwane Teacher Training College. The two primary schools are: Manzini Nazarene Primary school and Manzini Infant Practicing Primary school.

The aim of my research is to discover the extent to which Teacher Training Institutions in Eswatini support the integration of Environmental and Sustainability Education into the primary school teacher education curriculum practices as Pre-service Teachers are prepared for teaching and integrating Environmental and Sustainability Education into their curriculum planning and teaching practices. Participation by Pre-service Teachers, Lecturers and heads of Teacher Training Institutions will help each of them to reflect on their learning and teaching experiences in relation to Environmental and Sustainability Education.

The proposed study will be beneficial to individuals, institutions and the global community in that it will generate valuable data at such a time when the need to introduce sustainable lifestyles in society is so great. The data to be generated has the potential to positively influence policy and practice decisions not only by individuals but also at institutional, national and international levels, more so in support of the on-going 2030 United Nations Global Agenda.

The research activities will firstly include carrying out a survey that will involve 200 second year Pre-service Teacher respondents enrolled at William Pitcher Teacher Training College where a closed-ended questionnaire will be used to collect

quantitative data. Secondly, I will conduct formal semi-structured in-depth interviews with: the Principal of William Pitcher Teacher Training College where the study will be carried out; three Lecturers from William Pitcher Teacher Training College and two Pre-service Teachers enrolled at William Pitcher Teacher Training College. The second Teacher Training Institution, Ngwane Teacher Training College will provide 30 respondents in a pilot test on the questionnaire that was developed for this study. Thirdly, the two Pre-service Teachers to be interviewed will also be observed during their teaching practice exercise. The fourth aspect of my research will involve analyzing course outlines of the Lecturers that will be interviewed. All participants and respondents who volunteer to participate will be given consent letters for participation and will be required to sign them. Copies of consent letters to be issues for this study are enclosed.

Feedback will be given to those participating in the in-depth interviews as the study is undertaken. They will be availed the opportunity to delete narrative data they feel is inappropriate. Additionally, participants will have the option to discontinue their participation at any time. No costs will be incurred by the participating Teacher Training Institutions, primary schools or individual participants and respondents. A copy of the completed Thesis will be made available to the Eswatini Ministry of Education and Training.

My supervisor for this project is Dr. Ailwei Solomon Mawela, Department of Curriculum and Instructional Studies, College of Education at the University of South Africa. Should you require clarification on this study you can contact me or my supervisor at the following addresses.

Researcher   **Supervisor**

Job Stephen Kyamogi   **Prof. A. S. Mawela**
Southern Africa Nazarene University   **University of South Africa**
Faculty of Education   **College of Education**
P. O. Box 602   **Department of Curriculum and**
Manzini M 200   **Instructional Studies**
Cell phone: (+268) 76080568   **Cell phone: (+27)764132156**
Email: jobstephenkyamogi@gmail.com   **Email: mawelas@unisa.ac.za**

I thank you in advance for the service rendered in this matter. I look forward to a positive response.

Yours faithfully

Job Stephen Kyamogi

Researcher's signature _____ **Date**…………………………..

Supervisor's signature _____ **Date**…………………………..

Letter to the Vice-Chancellor, Southern Africa Nazarene University

May 2021

The Vice-Chancellor
Southern Africa Nazarene University
P. O. Box 6800
Manzini
Eswatini

Dear Madam

RE: Permission to conduct research at Southern Africa Nazarene University

Research Project Title: INVESTIGATING PRE-SERVICE TEACHERS' INTEGRATION OF ENVIRONMENTAL AND SUSTAINABILITY EDUCATION KNOWLEDGE, SKILLS AND ATTITUDES IN ESWATINI SCHOOL CURRICULUM

I am a lecturer at Southern Africa Nazarene University, Faculty of Education who is currently enrolled at the University of South Africa for a Doctor of Philosophy in Education degree focusing on curriculum studies.

I hereby request permission to conduct research at Southern Africa Nazarene University, Faculty of Education.

The aim of my research is to discover the extent to which Teacher Training Institutions in Eswatini support the integration of Environmental and Sustainability Education into the primary school teacher education curriculum practices as pre-service teachers are prepared for teaching and integrating Environmental and Sustainability Education into their curriculum planning and teaching practices. Participation by Pre-service Teachers, Lecturers, and heads of Teacher Training Institutions will help each of them to reflect on their learning and teaching experiences concerning Environmental and Sustainability Education.

The proposed study will be beneficial to individuals, institutions, and the global community in that it will generate valuable data at such a time when the need to introduce sustainable lifestyles in society is so great. The data to be generated has the potential to positively influence policy and practice decisions not only by individuals but also at institutional, national and international levels, more so in support of the on-going 2030 United Nations Global Agenda.

The research activities will firstly include carrying out a survey that will involve 200 second-year Pre-service teacher respondents where a closed-ended questionnaire will be used to collect quantitative data. Secondly, the researcher will conduct formal semi-structured in-depth interviews with: the Dean, Faculty of Education; three lecturers from the Faculty of Education and two Pre-service Teachers enrolled at the Faculty of Education, Southern Africa Nazarene University. The two Pre-service Teachers to be interviewed will also be observed during their teaching practice exercise. All the participants and respondents who volunteer to participate will be given consent letters for participation and will be required to sign them. Copies of consent letters to be issued for this study are enclosed.

Feedback will be given to those participating in the in-depth interviews as the study is undertaken. They will be availed the opportunity to delete narrative data they feel is inappropriate. Additionally, participants will have the option to discontinue their participation at any time. No costs will be incurred by Southern Africa Nazarene University or individual participants and respondents.

My supervisor for this project is Dr. Ailwei Solomon Mawela, Department of Curriculum and Instructional Studies, College of Education at the University of South Africa. Should you require clarification on this study you can contact me or my supervisor at the following addresses.

Researcher	Supervisor
Job Stephen Kyamogi	**Prof. A. S. Mawela**
Southern Africa Nazarene University	**University of South Africa**
Faculty of Education	**College of Education**
P. O. Box 602	**Department of Curriculum and**
Manzini M 200	**Instructional Studies**
Cell phone: (+268) 76080568	**Cell phone: (+27)764132156**
Email: jobstephenkyamogi@gmail.com	**Email: mawelas@unisa.ac.za**

I thank you in advance for the service rendered in this matter. I look forward to a positive response.

Yours faithfully

Job Stephen Kyamogi

Researcher's signature _____ **Date**………………………….

Supervisor's signature _____ **Date**………………………….

Appendix C: Consent to conduct research

The Government of the Kingdom of Eswatini

Ministry of Education & Training

Tel: (+268) 2 4042491/5
Fax:(+268) 2 404 3880

P. O. Box 39
Mbabane, ESWATINI

16th June, 2021

Attention:
Head Teacher:

| William Pitcher Teacher Training College | Manzini Nazarene Primary School |
| Ngwane Teacher Training College | Manzini Infant Practicing Primary School |
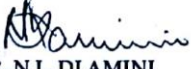
THROUGH
Manzini and Shiselweni Regional Education Officer

Dear Colleague,

RE: REQUEST FOR PERMISSION TO COLLECT DATA FOR UNIVERSITY OF SOUTH AFRICA (UNISA) STUDENT – MR. JOB STEPHEN KYAMOGI

1. The Ministry of Education and Training has received a request from Mr. Job Stephen Kyamogi, a student at the University of South Africa (UNISA) that in order for him to fulfill his academic requirements at the University he has to collect data (conduct research) and his study or research topic is: *"Investigating Pre-Service Teachers Integration of Environmental and Sustainability Education Knowledge, Skills and Attitudes in Eswatini School Curriculum".* The population for his study comprises of fifteen participants from the colleges and four hundred students from the primary school mentioned above. All details concerning the study are stated in the participants' consent form which will have to be signed by all participants before Mr. Kyamogi begins his data collection. Please note that parents will have to consent for all the participants below the age of 18 years participating in this study.

2. The Ministry of Education and Training requests your office to assist Mr. Kyamogi collect data virtually from the above mentioned school in the Manzini and Shiselweni regions as well as facilitate for the support he needs in his data collection process. Data collection period is one month.

DR. N.L. DLAMINI
DIRECTOR OF EDUCATION AND TRAINING
cc: Regional Education Officer – Manzini and Shiselweni
       Chief Inspector – Primary/Secondary
       Head of the above mentioned Institutions
       Prof. Ailwei Solomon Mawela – Research Supervisor

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SOUTHERN AFRICA NAZARENE UNIVERSITY

ADMINISTRATION

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SANU

18/06/2021

The Researcher
University of South Africa
College of Education
Department of Curriculum and Instructional Studies
Gauteng Province
South Africa

Dear Mr. Job Stephen Kyamogi

Re: Authorization to Conduct a Research Study in the SANU-FOE Premises

It is with pleasure to inform you that your request to conduct a research study titled: **"Investigating Pre-service Teachers' Integration of Environmental and Sustainability Education Knowledge, Skills and Attitudes in Eswatini School Curriculum"** at Southern Africa Nazarene University (SANU) has been duly considered and permission is granted.

The University is kindly requesting the researcher to guarantee the following conditions which are in line with the ethical considerations you have outlined in your application:

1. Ensure voluntary participation and safety of all the participants
2. Obtain written consent from each and every participant
3. Ensure anonymity where necessary during data collection
4. Confidentiality is strictly observed and that data is kept safe
5. That the university receives a copy of the report/findings on the proposed research study

Due to the prevailing COVID-19 pandemic, the university is requesting the researcher to take precautionary measures to minimize the spread of the virus, in accordance with the Kingdom of Eswatini COVID-19 National Guidelines.

All needed assistant and guidance during your data collection will be obtained through the dean of the faculty of education and the university would like to wish you well as you pursue your studies.

Yours sincerely

Dr. B. T. Sibandze
Acting Pro-Vice Chancellor Academics
Cc   : Acting Vice Chancellor
       : Dean-Faculty of Education

W W W . S A N U . A C . S Z

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Appendix D: Information letter and consent form

Letter of informed consent for the Vice-Chancellor, Southern Africa Nazarene University

June, 2021

Dear Madam

RE: Request to Participate in a Research Project

Research Project Title: INVESTIGATING PRE-SERVICE TEACHERS' INTEGRATION OF ENVIRONMENTAL AND SUSTAINABILITY EDUCATION KNOWLEDGE, SKILLS AND ATTITUDES IN ESWATINI SCHOOL CURRICULUM

This letter is an invitation requesting your participation in a study I, Job Stephen Kyamogi, am conducting, being part of my research work as a Doctor of Philosophy in Education degree student enrolled at the University of South Africa. Kindly read the contents of this letter carefully before you decide to participate.

Purpose of the Research Study

You are kindly invited to participate in a research project aimed at discovering the extent to which Teacher Training Institutions in Eswatini support the integration of Environmental and Sustainability Education into the primary school teacher education curriculum practices as Pre-service teachers are prepared for teaching and integrating Environmental and Sustainability Education into their curriculum planning and teaching practices.

What you will be asked to do

Participation in this research project will require you to be interviewed individually by the researcher on matters relating to Environmental and Sustainability Education integration, specifically, your views and experiences relating to the way Pre-service teachers are prepared for teaching and integrating Environmental and Sustainability Education into their curriculum planning and teaching practices and how the knowledge, skills and attitudes that they are acquiring at the Teacher Training Institution are being applied in their curriculum planning and teaching practices.

Time required

The single interview sessions will last for about one hour.

Risks and Benefits

Risks:

There is no anticipated risk or harm to you. The purpose of the interview, lesson observation and the use of a reflective journal is not meant to assess you in any way and the results will only be applied to this research study.

Benefits:

By your participation in this study, you will have the opportunity to interpret your individual understanding of Environmental and Sustainability Education matters as they relate not only to curriculum planning and teaching practices at Southern Africa Nazarene University but also the wellbeing of humankind globally.

Voluntary Participation and Confidentiality

Your participation in this study is voluntary. The interview can take place on any day in a mutually agreed upon location at a time convenient to you. Should you declare yourself willing to participate in the study, confidentiality is guaranteed. Your name will not appear anywhere in the research report.

Right to withdraw from the study

You may decline to answer any of the interview questions if you so wish. Furthermore, you may decide to withdraw from this study at any time without any negative consequences.

Agreement to participate in the research project

I have read, understood and considered the above which indicate the researcher's intentions and request for my participation in the research project. I voluntarily agree to participate in the research project. I hereby show my willingness to participate in the study by signing below.

Vice-Chancellor's signature…………………………………….. **Date**……………………

Audio recording

The researcher will wish to audio-record the interviews with you and hereby seeks your permission to do this.

Agreement for Audio recording

I understand that there will be audio-recording of the interview and that this recording will only be used for purposes of this research project without my name and picture appearing anywhere in the research report.

I agree to audio-recording: **Vice-Chancellor's signature**…………………… **Date**…...

Should you need any clarification or have questions about the research project, be free to contact me or my supervisor at the following addresses.

Researcher	Supervisor
Mr Job Stephen Kyamogi	Prof A. S. Mawela
Southern Africa Nazarene University	University of South Africa
Faculty of Education	College of Education
P. O. Box 602	Department of Curriculum and
Manzini M 200	Instructional Studies
Cell phone: (+268) 76080568	Cell phone: (+27)764132156
Email: jobstephenkyamogi@gmail.com	Email: mawelas@unisa.ac.za

Appendix E: Data collection tool: Questionnaire

TITLE: INVESTIGATING PRE-SERVICE TEACHERS' INTEGRATION OF ENVIRONMENTAL AND SUSTAINABILITY EDUCATION KNOWLEDGE, SKILLS AND ATTITUDES IN ESWATINI SCHOOL CURRICULUM

Dear student

You are invited to participate in the study seeking to establish the extent to which TEACHER TRAINING INSTITUTIONS (TTIs) in Eswatini prepare Pre-Service Teachers (PSTs) like you for teaching and integrating ENVIRONMENTAL AND SUSTAINABILITY EDUCATION (ESE) into their Curriculum planning and teaching practices. The questionnaire is divided into three sections.

- Section A requires you to provide personal background information. Please do not write your name anywhere on the questionnaire pages.
- Section B relates to ESE knowledge levels.
- Section C relates to the prevalence of pro-environmental attitudes.

The objectives of the questionnaire.

- To determine how much ESE knowledge is present among PSTs in Eswatini
- To establish whether or not pro-environmental attitudes are present among PSTs in Eswatini

As an individual responding to the given statements, your valuable input will provide me with important information that should help TTIs to better prepare PSTs to integrate ESE into their curriculum planning and teaching practices. This online questionnaire will take approximately 25 minutes.

Ethical considerations.

All information provided will be treated with confidentiality and will be used only for my research study. Your cooperation and sparing of your time are highly appreciated.

Participation in the study is optional. You are free to withdraw from filling in the questionnaire at any time.

Please answer to the best of your knowledge and experience as you are guided by the instructions given.

Thank you in advance for participating in this research study.

SECTION A: Socio-Demographics

Please provide background information about yourself by ticking the most appropriate option to each question or statement.

1. What is your Gender?

Male	1	
Female	2	

2. Please mark the appropriate range for your age.

20-24	25-29	30-34	35-39	40-44	45-49	50 or older
1	2	3	4	5	6	7

3. In which region in Eswatini do you stay?

Hhohho	Manzini	Shiselweni	Lubombo
1	2	3	4

4. Where in Eswatini is your home located?

Rural	1	
Urban	2	

SECTION B: Knowledge on Environmental and Sustainability Education issues.

Respond by choosing TRUE or FALSE at the end of each statement. Mark your choice with X in the space provided.

	TRUE	FALSE
1. Sustainable development emphasizes improving the quality of life on earth, the planet which sustains life.		
2. Firewood is the most commonly used form of renewable energy in rural areas in Eswatini.		
3. In Eswatini, Biofuel is locally produced on a large scale from Maize, Sugar cane, Wheat, and Jatropha.		
4. Non-renewable energy sources such as fossil fuel coal are a source of clean energy.		
5. Greenhouse gases such as water vapour and carbon dioxide have a great potential of saving the earth from environmental damage.		
6. Learning about, in, through, and for the environment is a more effective way of mediating ESE than just learning about the environment.		
7. When humans deal with economic, social, and political issues in a bad way, the environment is negatively impacted.		
8. Quality life for all living things in a healthy natural environment can be improved or compromised by human activities.		
9. It is of no benefit to teach ESE to young children in grade three and below.		
10. Practical activities, outdoor learning, and problem-solving forms of teaching are good educational strategies for ESE mediation.		
11. Plants, especially large trees, can help to reduce global warming.		
12. Today, the amount of carbon dioxide released in the atmosphere is much more than what plants can absorb. This is good for the environment.		
13. Indigenous knowledge of Eswatini elders is outdated and not useful in helping us to care for our environment.		
14. SDGs focus on promoting prosperity among rich nations while protecting the planet in sustainable ways.		
15. A lot of knowledge about the environment can help a person to act in favour of the environment.		

16. Every part of the Teacher Training Institution's natural and built environment can be used as a teaching and learning space for ESE.		
17. In Environmental and Sustainability Education, primary school learners' ideas and opinions are not good because many of them are misconceptions.		
18. The global average temperature of planet earth in the year 2021 is about 2.0 degrees Celsius warmer than it was 100 years ago due to climate change.		
19. Much of Eswatini's atmosphere is made up of clean fresh unpolluted air.		
20. The Kingdom of Eswatini does not have any laws that protect plants and animals.		
21. The greatest form of water pollution in Eswatini rivers and streams is caused by cows found in rural areas		
22. The government of Eswatini promotes the idea of creating more energy while at the same time using less of it.		
23. The Eswatini Ministry of Energy and Natural resources plans to use both clean energy sources (Solar and Wind) and the traditional sources (Coal and Fossil fuels) that cause pollution.		
24. In Eswatini, there is an energy crisis characterised by acute energy shortages.		
25. The Eswatini Environment Authority promotes the elimination of using disposable plastics		
26. Human overpopulation has no direct effect on the well-being of planet earth.		
27. Environmental problems are a threat to only wild animals and wild plants.		
28. Using certain chemicals to destroy weeds and pests on large and small farms can be harmful to the environment.		
29. The current climate change characterised by increases in average global temperatures can be controlled if there is global cooperation.		
30. It is practically not possible for people's homes on small islands to get submerged because of the rise in sea levels due to global warming.		

SECTION C: Prevalence of Pro-environmental attitudes

Please indicate how strongly you agree or disagree with the following statements regarding students' attitudes towards Environmental and Sustainability Education matters. Mark your choice with X in the space provided.

	STRONGLY AGREE	AGREE	NEITHER AGREE NOR DISAGREE	DIS AGREE	STRONGLY DISAGREE
1. I would find it difficult to avoid polluting land, water, and air.					
2. I use a dustbin whenever possible.					
3. I would not mind having a lot of cows even if they overgrazed the land.					

4. I usually find it sufficient to just teach about the environment in class without involving learners in outdoor activities.					
5. I would find it useful to promote, support, and sustain the wellbeing of our campus' physical environment.					
6. There is very little that I can do about preventing and stopping environmental degradation, such as soil erosion.					
7. I consider environmental problems to be politicised matters that have little bearing on real life challenges.					
8. It is not my duty but that of the government to protect endangered species of plants and animals.					
9. As a teacher, I am not the right person to promote sustainability practices among people.					
10. I would be willing to participate in programmes aimed at saving our planet's environment.					
11. As a teacher, I cannot succeed in changing learners' attitudes.					
12. I would rather try to save human life at the expense of environmental degradation; for example, I would destroy a forest to grow food crops for my family.					
13. I avoid practices that are harmful to the environment; for example, I discourage people from starting bush and/or veld fires.					
14. I support having the right number of people per given area to prevent environmental degradation that results from overpopulation.					
15. To be honest, I am not doing anything practical to					

contribute to environmental protection.					
16. I am currently practicing what I teach concerning protecting the environment					
17. I promote environmental responsibility and sustainability practices among learners, educators, and the support staff.					
18. I consider ESE to be relevant in our education system in Eswatini today. I would enjoy teaching Sustainability Development Goals (SDGs) to all my learners.					
19. I would enjoy training learners to look after the school's physical environment in areas such as picking litter to keep the compound clean.					
20. As an individual, my impact on the environment cannot influence the overall wellbeing of such a huge planet that we call home in our Solar System.					
21. I would find it difficult to adopt a sustainable lifestyle that is characterised by recycling, energy-saving and making lifestyle adjustments to minimise global warming.					
22. I actively encourage others to protect the environment and to properly manage Natural as well as Energy resources.					
23. I would be willing to positively influence any policies related to energy production, energy supply and energy usage at all levels of society.					
24. I am not that much bothered about environmental challenges in Eswatini.					
25. I am concerned about the current situation of soil gully erosion in Eswatini.					

26. I would be willing to donate some of my money to promote the well-being of animals and plants that are endangered.		25			
27. I would be willing to participate in water resource management activities in Eswatini.					
28. I would be willing to use all opportunities available to me as a teacher to promote sustainable development.					
29. I would be willing to participate in motivating and empowering others in areas that promote sustainable lifestyles.					
30. I make it my sole responsibility to ensure that my lifestyle positively impacts the environment.					

Thank you for your participation. Please email your filled Questionnaire to Mr. Job Stephen Kyamogi using the email address: jobstephenkyamogi@gmail.com

Appendix F: Data collection tool: Interview schedule

Interview schedule for the Vice-Chancellor, Southern Africa Nazarene University

(i) Personal, relating to Environmental and Sustainability Education

- What is your personal experience on matters relating to sustainability and the environment?
- How have you personally dealt with issues of environmental sustainability concerning the use of natural resources?
- What is your interpretation of the 2030 United Nations Global Agenda of Sustainable Development Goals ?
- How do you view the Kingdom of Eswatini as a global participant in attaining SDG 4?

- What are your views on a holistic institutional development approach where Environmental and Sustainability Education integration is concerned?
- How far do you think Eswatini as a nation has progressed concerning achieving Sustainable Development Goals?
- What suggestions would you give as additional strategies for Southern Africa Nazarene University to apply to ensure that Environmental and Sustainability Education is taught to transform students and communities?

(ii) Institutional Guidelines and Policies guiding Environmental and Sustainability Education Integration

- What are some of the policies guiding the integration of Environmental and Sustainability Education into curriculum practices of this Teacher Training Institution
- How can students get institutional support to participate as active change agents in the ongoing initiatives to contain the adverse effects of climate change?
- To what extent are current policies and practices regarding Environmental and Sustainability Education effective for meaningful Curriculum Implementation at the Faculty of Education?

- Is there any systemic commitment within the university's strategic planning to strengthen the integration of Environmental and Sustainability Education in her present and future curriculum practices?
- How has Southern Africa Nazarene University promoted a sustainability culture in her institutional governance structure?

(iii) Environmental and Sustainability Education and the Present Curriculum Practices

- To what extent has your office monitored the variety of teaching and learning approaches used by lecturers? Examples of such approaches include student-centered learning and facilitative teaching.
- What do you see as potential drivers and enabling mechanisms for effective integrative curriculum practices?
- How best can we capacitate educators and policymakers at all levels of society to best respond to Environmental and Sustainability Education issues?
- How has Southern Africa Nazarene University supported the academic community in your institution to meaningfully participate in community outreach, global networking, and working with international organizations such as MESA that stands for Mainstreaming Environment and Sustainability in African Universities?

- **Is there any extra information relating to sustainability and the environment that you may want to share?**

Appendix G: Data collection tool: Physical grounds and structures observation schedule

The researcher will mark with a **[✓]** where present and an [**X**] where absent

Features of living laboratories	✓	X	Comment
Grounds used as a medium for effective ESE mediation			
Grounds used as Living Laboratories offering creative solutions to real-world sustainability challenges			
The built environment and its natural physical surroundings act as Living Laboratories and enhance ESE integration			
The built environment and its natural physical surroundings used to engage learners in ESE issues that include: Energy-efficiency practices; water conservation; recycling of waste; climate change mitigation measures; green infrastructure adaptability; pollution elimination mitigation measures; sustainability consumption practices; carbon footprint measurement strategies			

Appendix H: Data collection tool: Teaching practice assessment document

ASSESSMENT TOOL FOR LESSON OBSERVATION

Student Teacher's Names: …………………………………………………………………

Date: ……………………………… Time: ……………………

Class Taught: ………………………. Subject Observed: ……………………………….

Number of Learners in the Class: …………………………………

Lesson Topic……………………………………………………………………………….

Scoring Key

Not acceptable	Needs improvement	Acceptable but can still improve	Above average	Excellent
1 point	**2 points**	**3 points**	**4 points**	**5 points**

	1	2	3	4	5
1. Lesson introduction interesting and relevant					
2. Lesson presentation ensured acquisition of new knowledge with the logical unfolding of content with correct level pitch					
3. Learner participation. Evidence of active involvement					
4. Teaching and learning support resources that are relevant, interesting, and supporting					
5. Classroom management. General student discipline and behaviour in-class activities. Controlled activity, individually and in groups					
6. Time utilized according to learners' abilities. The lesson progresses and ends on time					
7. Assessment in class and homework supported by lesson reflection and summary					
8. Alternative activities for fast learners as well as for learners with special needs					
9. Student teacher's general performance: Appearance and mannerism					
10. Language (Fluency, Proficiency, Subject terminology) pitched at the level of learners					
Total between 10 and 50 points multiplied by two to convert to a percentage mark between 20% and 100%					

Final student's score …………………………………………………………….

Constructive feedback and suggested improvements if applicable/needed.

…….
…….
…….
…….
………..

Appendix I: Observations in practice schedule

OBSERVATIONS IN PRACTICE SCHEDULE BASED ON ROGAN AND GRAYSON'S PROFILE OF THE CAPACITY TO SUPPORT INNOVATION

The researcher will put an X to indicate levels where profile indicators are observed

Profile Level	A single Profile Indicator was used			
	Physical Resources			
1				
2				
3				
4				

Table 5.41 Adapted from (Rogan and Grayson's Theory of Curriculum Implementation, 2003).

Appendix J: Tabulated interview data

Research question	Summary of interview responses	Emergent categories	Emergent themes
How is Environmental and Sustainability Education mediated in Teacher Training Institutions during the training of Pre-service Teachers?	*'The current lecturing needs to be translated into a living experience. There is a lot of head knowledge experience'.* (L2) *'One thing I observed is that it's very hard to change academics from lecturing. What we normally encourage among the lecturers is team work – team teaching'.* (L3)	Quality of ESE mediated -A lot of theory lecturing -Dominance of head knowledge experiences -Lack of teaching with practical activities -Limited infusion of ESE in selected topics	ESE MEDIATION EXPERIENCES
	'we all need to adapt from managerial level to students' level as consumers of educational services. The need to use up-to-date materials'. (T5) Connecting other platforms such as Zoom, WhatsApp, Google Classroom etc. has not been possible'. (T2) 'this mode is not very adequate in delivering meaningful learning to students. Online may be offering good learning platforms because of individualized learning spaces…those who are committed are doing well especially research based inquiry inclined learning'. (T3)	Utilisation of online educational platform services -Students' reluctance to utilise online services -Lecturers' limited support to using online services for students -Prevalence of poor service provision -Requirement of commitment and adequate financial supply	
	'I have not used physical structures at tertiary level even though I used them at high school level. A lot is taught theoretically with less emphasis on practical activities. We don't have technology for virtual practical activities'. (T4) 'I wouldn't say I have considered using physical structures and surrounding areas as a medium to students engaging in ESE activities but we have done it at primary and high school level. As we go higher, it becomes harder. We have separated living and learning. Now we just talk about planting trees without planting any trees'. (T5) '…the physical structures and surrounding areas as a medium to students engaging in ESE activities? A few years ago, all those indigenous trees were cut down and were replaced by concrete decorations. Taking away those trees was depriving and I haven't recovered from that'. (T3)	Use of physical structures and grounds -Limited use of structures and grounds to mediate learning -Unavailability of structures and grounds to mediate learning -Separation of living and learning	
	'I have observed changes in behavioral patterns among PSTs that occurred after teaching practice'. (T3) and (T5) 'yes, there is transformation as we teach focusing on the Affective Domain'. (T2) 'changes in behavioral patterns have been observed among PSTs during teaching practice where I like to promote participatory learning'. (T3)	Observed transformation of PSTs -PSTs transformation hard to assess -Transformation noted among PSTs -Teaching practice experiences good transforming sites -Focusing on Affective Domain -Promoting participatory learning to foster transformation	
To what extent are targets 4.7 and 4c of	, *'in general, I understand the SDGs but at the same time, I have question marks on*	Individual possession of knowledge on SDGs	THEME TWO: INTERFACING SDG 04,

Research question	Summary of interview responses	Emergent categories	Emergent themes
Sustainable Development Goal 4 integrated into the Teacher Training Institutions curriculum?	*some of the goals that they are pushing'.* (T5) 'many Lecturers lack the basic ESE knowledge such as the ability to unpack SDGs. Many are disconnected from the SDG discourse and climate change issues. They do not connect the social, political aspects that predetermine the quality and standard of life'. (T1) , *'I've heard about SDGs in Sociology in education where we were introduced to SDGs. They also included it in the exams, we answered some of the questions. SDGs are so important especially the way the teacher introduced them to us'.* (S3) *'SDGs were not discussed that much in lecture room experiences where Environment, Sustainability or Sustainable Development Goals were mentioned'.* (S4) *'I have not heard about SDGs and even COP 26 related issues. I don't know anything'.* (S1)	-Lack of adequate SDG knowledge by Lecturers and PSTs -Limited prevalence of SDG head knowledge	TARGETS 4.7 AND 4c WITH TTI CURRICULUM PRACTICES
	'it just can't be head knowledge. So head knowledge and practical experience is the best… and is best incorporated into our programmes by first transforming the lecturers before we even get to the students. The SDGs are something that we all strive towards and it is always quoted in what everybody does'. (L2) , 'for now, incorporate Sustainable Development Goals in their functions and operations beyond class activities is lacking'. (T2) 'SDGs have been communicated and SDG matter is part of the modules being taught. There is a lot of ESE-ESD in the curriculum but it is not explicitly expressed'. (T4) 'SDGs teaching was affected negatively. I think the SDGs were absorbed into some of the topics e.g. in Geography and science. Now when I compare it, I think they covered everything. They were infused but not mentioned directly…. It's only the practical part that we didn't do. Am well versed with the theory part'. (S3)	Communicating SDGs with PSTs -Lack of practically lived SDG based experiences -Limited SDG integration in functions, operations and practices -Lack of explicit expression of SDG content	
	'yes, there is a systemic commitment within the university's strategic planning to strengthen the integration of Environmental and Sustainability Education in her present and future curriculum practices'.(L1) It is such a form of commitment that aligns institutional programmes with SDGs. , '…it is wonderfully written down on paper but it's the implementation of them that are far lacking'. (L2) 'I think the 2030 SDG agenda can gain ground if we integrate it into our strategic plan. The main focus here is that we integrate – whichever way we do it'. (L3) *'the seeds were sown but MESA's influence on the infusion of target 4.7 and 4c of SDG 4 need to be investigated. When we look at my faculty for example, a few people have tried to implement the*	Policies and Agency for SDG integration -Policies with limited impact in strategic planning -Lack of aligning institutional programmes with SDGs -Lack of explicit reference to ESE -Lack of policies that promote Agency	

Research question	Summary of interview responses	Emergent categories	Emergent themes
	proposals MESA put across. Maybe only 20% of the lecturers have done something about it. Only those in the environmental science department. For the others, I don't know'. (O1) *'as of now, as countries, we need to mainstream our programmes and to align them to the SDGs Agenda so what am observing is that the work that we do sometimes we do not link it to the SDGs. It's only at the time of reporting that we start looking for the connections – that 'this activity or that activity is aligned to SDGs''.* (O2) *'to a very little extent, Teacher Training Institutions' educators have succeeded as change agents to deliver educational services that promote achieving Sustainable Development Goals'.* (T5) *'our policy documents do not have explicit reference to ESE. We are not incorporating SDGs in our functions and operations beyond the little that is taking place in the classroom'.* (T4) *'my view is that we still have to do more. There is still a long way to go. For now, incorporate Sustainable Development Goals in their functions and operations beyond class activities is lacking'.* (T2) *'there is nothing much to write about with respect to Policies, Practices and Agency. Policies of SDG and ESE should be intentionally suggested hence to almost no extent have TTIs succeeded as change agents to deliver educational services that promote achieving SDGs. We need to facilitate, guide and direct TTIs into SDG Arenas – working with them in learning led activities at class and club levels'.* (T6)		
What are the factors at Teacher Training Institutions that enhance and/or hinder the integration of Environmental and Sustainability Education knowledge, skills and attitudes during Pre-service Teachers' training?	'in terms of academics, I have encouraged them to reinstitute programmes that are directly related to sensitising our communities about ensuring that the environment is taken care of. The curriculum that we have presently for our pre-service primary school teachers as we review it, we must have topics on the environment'. (L1) 'everybody would have to kind of be on board. Yes, lecturers but even the administration should bless the campaign and be ready to support it. That's the kind of way you really get things done if you have the support of the leadership'. (L2) 'key enhancers to the development of pro-environmental attitudes and behaviours among pre-service teachers involves creating awareness, then you capacitate. Lecturers are taking ownership given the way they are handling their CP and that is capacitation. Students want to be part of any planning process that involves them. They want to be engaged from commencement of a planning stage if you don't want them to resist'. (L3) 'through awareness and capacity building awareness campaigns, MESA needs to team up with municipalities.	Capacitating Human Resource -Human resource capacitation Empowerment with ESE knowledge -Policy creation to guide ESE integration -2030 UNGA in strategic planning of TTIs -Research findings guiding visible implementation -Cooperation and adequate financial support	THEME 03: SUPPORT FOR EFFECTIVE ESE INTEGRATION IN TTI CURRICULUM PRACTICES

Research question	Summary of interview responses	Emergent categories	Emergent themes
	One of the initiatives that I have seen them coming up with is the introduction of environmental talks at the pre-primary, primary and high schools within their jurisdiction'. (O1) 'there is a need to engage PSTs in workshops and green movement initiatives using the participatory approach to own what they do'. (T1) we are not collaborating adequately. The thick department insulations hamper integration. It is true that collaboration complements integration and interdepartmental corporation would operate well even after creating a separate module'. (T1) 'resistance to a new mode of integrating can be reduced by engaging everyone in the academic and support staff'. (T4) 'students are change agents. Empower them through approaches that promote participation and ownership which equates to transformative teaching. Transform them as they learn. What are we preaching? We are not preaching anything in terms of Sustainability! However, on the ground our practices are speaking loud e.g. the clean green grounds. Our compound is a big story. We plant trees, have a forest and we practice effective rubbish collection. Such observed practices are demonstrating sustainability life styles'.(T1) 'the enablers as pillars to support the module entail involvement and engagement of the curriculum centre, examination council, EMoET and EEA as key external players. Conservation bodies would contribute'. (T1) 'for us when you integrate, it must involve everyone whether it is support staff or academic so that we can have different programmes…. That programme is a course, a stand-alone including all subjects to ensure that everyone is involved on this. We are using an integrated approach to teach ESD. We are integrating using the integrating approach. We are designing an ESD course that will be a full course that focuses on both theory and practicals'. (L3) 'we've got a chance, drawing up new programmes so it's a good time now to start. It can make us to stand apart of other people. The challenge is on our side to craft it in such a way that it hits a note to the policy makers at national level as well as scaling it up to our B.Ed. programme i.e. the global agenda to be part of the B.Ed. curriculum. This could be carried through all the subjects but it could also be a completely standalone programme beyond the status of a module'. (L2)	Promoting, participation and ownership -Involving stakeholders in decision making structures -Interdepartmental collaboration -Blurring thick subject insulations -Promoting transformative participatory teaching approaches -Promoting Agency and intentionality Creating a standalone ESE Subject -Standalone ESE module form of integration -ESE module aligned to the 2030 UNGA -Trans-disciplinarity promoted in ESE module	

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Research question	Summary of interview responses	Emergent categories	Emergent themes
	'the best way to integrate ESE? Infusion is the route MESA is taking. Infuse it in the different courses but in my faculty, the course SD was introduced in only one programme that deals with environmental management and water resources. It is a standalone module or course'. (O1) 'I would support having a course on sustainability and to have ESD concepts infused in other existing courses. It is only then that the teachers will be able to implement sustainability principles at the classroom level because they would know that it's integrated in all subjects'.(O2) 'manage change process by process, that which you can influence closer to you. Start small, think big and make sure you act. I have managed to start small from students by engaging them. Infusion and integration is possible at course outline level. Start small and upscale to a complete level – design material as that of SST enquiry based learning (It blends well). A module that is composed of different subjects – the bits will make the whole'.(T1) 'there should be a standalone subject at the primary school level for effective ESE integration into curriculum practices. ESE can be integrated using an integrative module that combines ESE and Climate Change Education. Government should be intentional about its people becoming knowledgeable from primary level education. The TTIs also need a standalone integrative module that starts in first year. Handling bits and pieces is not sustainable'. .(T1) 'PSTs have IK and I see it as being foundational to good Pedagogical Content Knowledge relating with ESE. IK creates the context to start the teaching- learning experience. IK and ESE are complementing units. Students have a fair amount of knowledge on Eswatini Biodiversity and Eswatini Environment Authority By-laws that protect our Fauna and Flora. IK is taught to primary school learners and PSTs need adequate equipping to be able to teach it well'. (T4) yes, students relate to IK, the Mhlonyane, Eucalyptus and other traditional remedies. One time during a lesson, the students wanted to verify if IK was relevant. They were not sure that it would be accepted in the modern setting. They asked about Umsuthane. Therefore, we should not leave out the home 'stuff''. (T1) , 'the need to promote 'ekhaya' values is a powerful idea and heritage knowledge will be added within the consumer science, traditional ways of producing medicine and preserving food will be part of curriculum transformation'. (T4)	Utilising IK for effective ESE Integration -IK and sustainable lifestyles -IK as relevant contexts for ESE integration - Prioritising and promoting IK in TTIs	

Research question	Summary of interview responses	Emergent categories	Emergent themes
	, 'Khoisan People interacted with nature and respected it using Indigenous Knowledge (IK) as s hunter gathering society. They conserved and never over exploited the natural resources around them. Their interaction with the physical and biological components was sustainable in nature. They managed the environment exceedingly well and teaching such would empower PSTs and facilitate their ability to integrate ESE….' (T6)		

Source: Compiled by researcher

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Appendix K: Analytical tool for Lesson Framing

		SELECTION			
Criteria	**Indicator**	**F++** **(Very strong framing)**	**F+** **(Strong framing)**	**F-** **(Weak framing)**	**F- -** **(Very weak framing)**
Lesson progression	Control of selection of whole lesson content	The selection of knowledge in discussion is almost always determined by the teacher.	The selection of knowledge in the discussion is determined by the teacher most of the time. On very few occasions is selection varied according to learner contributions.	Learners have the opportunity to vary the selection of knowledge some of the time. Some learner suggestions are accepted, or the teacher alters selection, the course of discussion according to learners' contributions.	Learners often make decisions around the selection of lesson content in the classroom. They are usually given the opportunity to contribute to the lesson content
Selecting educational resources	Control of selection of type of educational resources used in the lesson	The selection of educational resources in the classroom is always or almost always determined by the teacher.	The selection of educational resources in the classroom is determined by the teacher most of the time	Learners have the opportunity to vary the selection of educational resources in the classroom some of the time. Some learner suggestions are accepted, or the teacher alters selection according to learners' productions.	Learners often make decisions around the selection of selection of educational resources in the classroom. They are given opportunities to contribute to the knowledge content of the lessons.
Doing activities	Control of selection of activities for the lesson	The selection of activities for the lesson is always or almost always determined by the teacher.	The selection of activities for the lesson is determined by the teacher most of the time. On very few occasions, learner contribution is accepted.	Learners have the opportunity to vary the selection of activities for the lesson some of the time. Some learner suggestions are accepted, or the teacher alters selection according to learners' contributions	Learners often make decisions around the selection of activities for the lesson. They are given opportunities to determine the activity part of the lessons.
Linking activities during the lesson	Control of decisions around choice of activity to link	Learners rarely or never make decisions around choice of activity to link Choices on how to link activities are generally dictated by the teacher.	The selection of activities to link is determined by the teacher most of the time. On very few occasions, learner contribution is accepted.	Learners have the opportunity to vary the selection of activities they wish to link some of the time. Some learner suggestions are accepted, or the teacher alters selection of what is linked according to learners' contributions.	Learners often make decisions around the selection of activities to link during the lesson. They are given opportunities to determine the linking activity part of the lessons.

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SEQUENCING

Criteria	Indicator	F++ (Very strong framing)	F+ (Strong framing)	F- (Weak framing)	F- - (Very weak framing)
Lesson sequencing	Control of order of teaching and learning experiences in class.	The teacher always or almost always determines the order of teaching and learning experiences in class.	The teacher more than half of the time determines the order in which learning should take place in class.	Learners have the opportunity to vary the order in which learning should take place in class some of the time. The teacher sometimes responds to learners' input by varying the sequence of the learning.	Learners often make decisions around the sequence of tasks and activities in class. They are regularly given options regarding the order in which to do things.

PACING

		F++ (Very strong framing)	F+ (Strong framing)	F- (Weak framing)	F- - (Very weak framing)
Criteria	Indicator	Learners have very little control over the pace	Learners have a little control over the pace	Learners have some control over the pace	Learners have substantial control over the pace
Lesson progression. Introduction and discussion sessions	Control of interventions and questions during lesson progression	The teacher most of the time ignores learners' input as the lesson progresses.	The teacher accepts little learner input and questions.	The teacher accepts some learner input and questions making sure that all learners are ready to move on before doing so.	The teacher accepts most or all learner input and questions ensuring that all learners are ready to move on before doing so. The discussion may extend or deviate due to learners' input.
Practical activities during lesson	Control of tasks, learner pace and time frames	The pace at which learners work through tasks is almost always strictly controlled by the teacher	The pace at which learners work through tasks is mostly determined by the teacher.	Learners work at their own pace. The teacher exercises some control over pace, but remains open to its variation.	Learners work at their own pace. The teacher places no pressure on them to finish in a stipulated period, but generally waits until they have all finished, or gives them further opportunities to catch up

Appendix L: Photographs

Photo 1: Well-kept grounds and excellent buildings at institution TA	Photo 2: Well-kept grounds and excellent buildings at institution TA
Photo 3: Tree planting to replace a dead one at Institution TA	Photo 4: A living laboratory at Institution TA

Photo 5: Recycling practices institution TA	Photo 6: Adequate basic buildings at school P3
Photo 7: Sustainable utilisation of natural resources at school P3	Photo 8: Proper handling of waste at institution P3
Photo 9: Well-kept surroundings at school P1	Photo 10: Adequate basic buildings at school P1

Photo 11: Well-kept surroundings at school P2

Photo 12: Proper handling of waste at school P2

Photo 13: Rubbish collection and disposal at institution TA

Appendix M: Course outlines for institution TE

Table 5.1: Course outlines for institution TE

Subject	Course code	Course Aim(s) and/or Objectives (not provided)	Listed main course topics
Science education	SCI 221		Science curriculum -Teaching approaches in Science -Teaching methods -Assessment -Practical work in science and improvisation -General Laboratory techniques and stock control -Laboratory management and safety -Planning for a lesson -Teaching practice -Science and society -Motivation -Resource materials -Current learning theories -Nature of Science (NOS) in secondary science classrooms
SCP301 COURSE OUTLINE	SCP 301		LINEAR & GRAVITATIONAL MOTION ➢ Concepts, definition ➢ Distance and displacement ➢ Speed and Velocity ➢ Acceleration ➢ Equations of motion ➢ Distance, speed and acceleration - time graph MOTION UNDER GRAVITY ➢ The Simple Pendulum ➢ Calculating period, length and frequency using formula ➢ Experimental determination of acceleration due to gravity using a simple pendulum
SCP302 COURSE OUTLINE	SCP302		1. CENTRE OF GRAVITY 1.1 Definition 1.2 Finding the centre of mass experimentally 1.3 Calculating the position of centre of mass 1.4 Stability

Subject	Course code	Course Aim(s) and/or Objectives (not provided)	Listed main course topics

			2. PRINCIPLE OF MOMENT
			  2.1 Definition
			  2.2 Application of the principle of moment
			  2.3 Calculations on determining unknown weights and lengths
			  2.4 Experimental approach to determining unknown weights and lengths
			3. FLUID MECHANICS
			  3.1 DENSITY AND RELATIVE DENSITY
			  3.1.1 Density
			  3.1.2 Relative Density
			  3.1.3 Specific gravity
			  3.1.4 Hydrometer
			  3.1.5 Uses of relative density
			  3.1.6 Calculations of relative density
			  3.2 BUOYANCY AND ARCHIMEDES PRINCIPLE
			  3.3.1 Buoyant force
			  3.3.2 Archimedes Principle
			  3.3.3 Laws of floatation
			  3.3.4 Hot air balloon

SCP 102 COURSE OUTLINE	SCP 102		**1.** PHYSICAL QUANTITIES
			  1.1 Basic quantities
			    1.1.1 Length, mass and time
			    1.1.2 S.I. units of measurement
			    1.1.3 Devices for measuring length, mass and time.
			
			  1.2 Derived quantities
			    1.2.1 Definition of volume and units for volume
			    1.2.2 Measuring volume of bodies using measuring cylinders and the eureka can.
			    1.2.3 Definition of density and units of

Subject	Course code	Course Aim(s) and/or Objectives (not provided)	Listed main course topics
			measurement for density 1.2.4 Determining densities of different bodies. 1.3 pendulum 1.3.1 describing the pendulum 1.3.2 Effects of the mass of bob, length of string and the size of the swing. **2.** FORCE 2.1 basic principles of the concept of force 2.2.1 definition of force 2.2.2 brief description of the types of forces 2.2 motion under gravity 2.2.1 concept and definition of weight 2.2.2 distinction between mass and weight **3.** WORK ENERGY AND POWER 3.1.1 concept and definitions of work energy and power 3.1.2 SI units of work, energy and power 3.1.3 Mathematical applications of the concepts and the definitions 3.2 Forms of energy 3.2.1 Mechanical, heat, sound and power 3.2.2 Transformation and conservation of energy **4.** STATIC ELECTRICITY 4.1.1 Charging by friction and induction

Subject	Course code	Course Aim(s) and/or Objectives (not provided)	Listed main course topics
			4.1.2 Positive and negative charges **5.** ELECTRICITY 5.1 sources of electricity (accumulators and generators) 5.2 Simple circuits with bulbs, cells and switches 5.3 Conductors and insulators and their properties 5.4 Series and parallel circuit 5.5 Connecting a three pin plug 5.6 Ohm's law and its verification as well as the application to the measurement of resistance **6.** OPTICS 6.1 propagation of light 6.1.1 nature of light (Huygens's wave theory) speed and wavelength of light 6.1.2 concept of a ray of light (rectilinear propagation of light)
SCP 201P COURSE OULINE			**1. HEAT ENERGY** 1.1 Heat and temperature 1.1.1 Distinction between heat and temperature 1.1.2 Units of heat and temperature 1.1.3 Uses of thermometers 1.2 Expansion 2.1.1 Advantages and disadvantages of expansion 2.2.2 Experiment evidence, e.g. ball and ring 1.3 Heat transfer 3.1.1 Conduction 3.1.2 Rate of conduction

Subject	Course code	Course Aim(s) and/or Objectives (not provided)	Listed main course topics

	SCP 201		3.1.3 Uses of conductors and insulators
			3.2.1 Convection in fluids
			3.2.2 Applications of convection
			3.3.1 Radiation
			3.3.2Application of radiation
			3.3.3 Vacuum flask
			2. AIR PRESSURE
			 2.1 Air and air pressure
			    2.1.1 Constituents and properties of air
			 2.2 Pressure
			    2.2.1 Definition and units of pressure
			    2.2.2 Experimental evidence of atmospheric pressure
			    2.2.3 Importance of atmospheric pressure
			    2.2.4 Measurement of atmospheric pressure and instruments used
			
			3. FORCES
			 3.1 Principles of moments
			    3.1.1 Moment of a force
			    3.1.2 Couple (torque) e.g. turning a corkscrew and water tap
			    3.1.3 Resultant and equilibrium forces
			 3.2 Simple machines
			    3.2.1 Types of simple machines, (inclined plane, the screw, the wage, and the lever).
			    3.3 machine as a device for doing
			    3.3.1 Force ratio (M.A)
			    3.3.2 Velocity ratio (V.R)
			    3.3.3 Efficiency of a machine
			4. MAGNETISM
			 4.1 Lodestone and artificial magnets
			    4.1.1 Properties of magnets
			    4.1.2 Magnetic properties of iron and steel
			    4.1.3 Electromagnets and their uses
			    4.1.4 Magnetic field due to a bar magnet

SCI 221 SCIENCE EDUCATION COURSE OUTLINES FOR INSTITUTION TE		
	TOPIC	**LEARNING OBJECTIVES**
1	**Science curriculum**	➢ Aims of science education ➢ Describe the philosophy and methodology of science education ➢ describe science characteristics, knowledge and inquiry ➢ Science in the school curriculum- the national and school syllabi
2	**Teaching approaches in Science** 2.1 the content (syllabus) approach 2.2 the process approach 2.3 the concept approach 2.4 the inquiry approach 2.5 the STS and context- based approach 2.6 the inductive and deductive approach 2.7 ASEI-PDSI paradigm	➢ Differentiate between the different teaching approaches ➢ Design learning activities based on the different approaches ➢ Evaluate the use of each teaching approach in science
3	**Teaching methods** 3.1 lecture and lecture-cum 3.2 group dynamics – group work, discussion 3.3 internet 3.4 discovery 3.5 socratic 3.6 problem solving/ project-based 3.7 practical and field trips	➢ Name the different teaching methods ➢ Describe each teaching method ➢ Discuss the pros and cons of each method and its application in teaching/learning science ➢ Design learning activities based on the different approaches ➢ Discuss effective questioning techniques in teaching/learning of science ➢ Design questions for a particular situation e.g lower order and higher order; open ended and closed questions

TEACHING METHODS AND ASSESSMENT		
1	Teaching methods	➢ Lecturing ➢ Tutorials ➢ Individual assignment ➢ Tests ➢ Presentations/discussion forums
2	Assessment	Course work – has weighting of 50% Examination – has weighting of 50%

SCI 222 SCIENCE EDUCATION COURSE OUTLINE		
	TOPIC	**LEARNING OBJECTIVES**
1	**1.1 Practical work in science and improvisation**	➢ Describe the types and roles of practical work in teaching and learning ➢ Describe how practical work is planned Describe: ➢ Safe heating of liquids in test tubes; Safe pouring of liquids; Handling mercury;

SCI 222 SCIENCE EDUCATION COURSE OUTLINE		
	TOPIC	**LEARNING OBJECTIVES**
	1.2 General Laboratory techniques and stock control	Loosening glass stoppers; Working with glass; Adjusting a Bunsen burner; Care of balances; Care of wooden bench tops; Adhesives; Preparation of bench solutions; Stock control and stock taking ➤ Discuss how to improvise and design improvising laboratory equipment
2	**Laboratory management and safety** 2.1 General laboratory safety 2.2 laboratory management 2.3 Basic first aid	Discuss about: ➤ Good Laboratory practices ➤ Personal Protective Equipment (PPE) ➤ Symbolic safety signs ➤ Discipline in the laboratory ➤ Laboratory rules ➤ Supervision in the laboratory ➤ Care and storage of simple equipment and chemicals (corrosives, flammables etc) ➤ First aid and first aid kit ➤ Chemical safety ➤ Waste management ➤ Biosafety ➤ Electrical safety ➤ Fire safety
3	**Planning for a lesson** 3.1 scheme of work 3.2 lesson plan 3.3 construction of test items 3.4 marking 3.5 record keeping 3.6 micro teaching and peer teaching	➤ Describe the role of the scheme of work and lesson plan ➤ Outline the components of a scheme of work and a lesson plan (e,g 5E lesson plan) ➤ Design a scheme of work for secondary science ➤ Design 5E lesson plans using learner-centered approaches ➤ Describe the aims and objectives of classroom tests ➤ Describe the different types of tests ➤ State the properties or characteristics of a good test ➤ Basic principles to follow in the construction of tests in the classroom ➤ Constructing different types of tests ➤ Advantages and limitations for each type of test ➤ Describe the types of marking (analytical, impression, multiple, positive and negative) ➤ Describe the role of marking scheme and rubric ➤ Design a marking code, marking scheme/rubric

SCI 222 SCIENCE EDUCATION COURSE OUTLINE	
TOPIC	**LEARNING OBJECTIVES**
	➢ Describe record keeping in science (student marks, stock book and accountability, inventory) ➢ Differentiate between microteaching and peer teaching ➢ Describe the role of microteaching and peer teaching ➢ Design and present microteaching lesson using any secondary science topic

TEACHING METHODS AND ASSESSMENT		
1	Teaching methods	➢ Lecturing ➢ Tutorials ➢ Individual assignment ➢ Tests ➢ Presentations/discussion forums
2	Assessment	Course work – has weighting of 50% Examination – has weighting of 50%

SCI 321 SCIENCE EDUCATION COURSE OUTLINE		
	TOPIC	**LEARNING OBJECTIVES**
1	**1.1 Teaching practice**	➢ Describe teaching practice and its importance in Science education ➢ Evaluate teaching practice experiences
	1.2 Science and society	➢ Discuss value and relationship of science education in Eswatini ➢ Relevance of Junior Certificate Science for learners and society ➢ Discuss the role of language in teaching/learning science
2	**2.1 Motivation**	➢ Discuss ways of engaging pupils in a task ➢ Discuss about learners' abilities ➢ Differentiate between teaching aids and instructional materials
	2.2 Resource materials	➢ Describe the role of teaching aids and instructional materials ➢ Describe the types of T/L aids and IM available ➢ Discuss about the selection criteria, and utilization.

TEACHING METHODS AND ASSESSMENT		
1	Teaching methods	➢ Lecturing ➢ Tutorials

		➢ Individual assignment ➢ Tests ➢ Presentations/discussion forums
2	Assessment	Course work – has weighting of 50% Examination – has weighting of 50%

SCI 322 SCIENCE EDUCATION COURSE OUTLINE		
	TOPIC	**LEARNING OBJECTIVES**
1	**1.1 modes of assessment** **1.2 Test evaluation**	➢ Differentiate between norm-referenced, criterion-referenced and diagnostic, formative and summative ➢ Describe the types of tests validity and reliability ➢ Describe methods of estimating the reliability of science test ➢ Discuss how to measure item effectiveness (facility index, discrimination index, difficulty index, guessing score)
2	**Current learning theories**	• Discuss behaviourism, cognitivism and constructivism and their implications in the teaching of science with particular emphasis on constructivism and the conceptual change model (CCM). • Relate the theories of learning with instructional approaches and methods that include inquiry based teaching, project based teaching, and context based teaching and metacognitive strategies such as the use of concept mapping teaching/learning strategies and reflective journals. • Discuss concept mapping in details and its role in facilitating learning of concepts.
3	**Nature of Science (NOS) in secondary science classrooms**	• Define scientific literacy. • State three aspects of scientific literacy • Revise the empirical, inferential, creative and tentative aspects of NOS. • Discuss implicit and explicit approaches to teaching NOS and their impact in developing students' understanding of science. • Discuss different context as suggested by literature that can be used students' conceptions of the nature of science can be explicitly addressed. • Use their understanding of the above mentioned aspects of NOS to design learning activities that allow students to

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| SCI 322 SCIENCE EDUCATION COURSE OUTLINE ||
TOPIC	LEARNING OBJECTIVES
	reflect about these NOS aspects in the primary classroom. • Group planning, teaching and structured reflection of lesson presentations.

TEACHING METHODS AND ASSESSMENT		
1	Teaching methods	➢ Lecturing ➢ Tutorials ➢ Individual assignment ➢ Tests ➢ Presentations/discussion forums
2	Assessment	Course work – has weighting of 50% Examination – has weighting of 50%

Appendix N: Proof of editing

To whom it may concern

This letter serves to confirm that editing and proofreading was done for:

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Doctor of Philosophy

Curriculum and Instructional Studies

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INVESTIGATING PRE-SERVICE TEACHERS' PREPARATION FOR THE INTEGRATION OF ENVIRONMENTAL AND SUSTAINABILITY EDUCATION KNOWLEDGE, SKILLS AND ATTITUDES INTO THE ESWATINI SCHOOL CURRICULUM

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Appendix O: Turnitin report

Turnitin Originality Report

- Processed on: 18-Jul-2022 11:22 SAST
- ID: 1872053762
- Word Count: 115634
- Submitted: 1

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