



A critical exploration of the attitudes towards and knowledge of natural resource management amongst first-year Natural Resource Management students.

An environmental education case study of the Nelson Mandela University, George Campus, 2019 – 2021

By Eileen Jooste

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Supervisor: Dr. Angela Bianca Langtry Currie

Co-Supervisor: Prof. Jennifer Anne Clarence-Fincham

## DECLARATION BY CANDIDATE

**Name:** Eileen Jooste

Student number: 214019101

**Qualification:** MSc Nature Conservation

**Title of project:** A critical exploration of attitudes and knowledge of first-year Natural Resource Management students at Nelson Mandela University, George Campus.

Declaration:

In accordance with Rule G5.11.4, I hereby declare that the above thesis is my own work and that it has not previously been submitted for assessment to another University or for another qualification.

Signature: 

Date: 18 October 2021

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## ABSTRACT

Available literature suggests that there is a need to gain more understanding of what students' environmental attitudes and knowledge are and how they are developed by education systems. Education, in general, plays an important role in students' attitudes and their knowledge of the world around them. It can shape students' awareness of their natural environment and contribute to their understanding of environmental issues. Education can also strengthen students' critical thinking, build awareness, stimulate problem solving, and promote sustainable practices. It has the potential to empower students to address global challenges from their own diverse perspectives and prepare them to uphold the economy. Education can improve and maintain societal wellbeing and can help students to maintain the natural environment, along with achieving sustainable development. Environmental education, specifically, can play a big role in how students deal with the natural environment.

The primary aim of this qualitative research study was to examine first-year students' environmental attitudes and knowledge in the School of Natural Resource Management at the Nelson Mandela University George Campus, South Africa. First-year students' environmental attitudes and knowledge were examined as they entered the university, and then again at the end of the first semester once they had completed a module in ecology. More specifically, at the outset of the research the objectives were (1) to establish an understanding of the baseline environmental attitudes and knowledge of first-year students who were undertaking three ecological modules being offered by the School of Natural Resource Management; (2) to assess the changes in the first-year students' environmental attitudes and knowledge, using a post-intervention strategy; (3) to understand what type of teaching approaches were used by the lecturers teaching the ecological modules; and (4) to evaluate how the teaching approaches of the lecturers influenced the baseline environmental attitudes and knowledge of the student group.

This research took place in the midst of the Corona Virus pandemic, which had significantly influenced the teaching and learning environment. Multiple education systems, including those of the Nelson Mandela University George Campus, had to rapidly transition to online teaching and learning. So, although unplanned for, this

research could not ignore the rapid transition to online teaching and learning and the role it played in shaping the first-year School of Natural Resource Management students' environmental attitudes and knowledge. It also impacted the teaching approaches of the environmental lecturers. An additional objective in response to the rapid transition to online teaching and learning was, therefore, added: (5) to understand the experiences of the first-year School of Natural Resource Management students and the three environmental lecturers who had to rapidly transition to online teaching and learning.

Data was collected via questionnaires and semi-structured interviews with students and staff in the School of Natural Resource Management at Nelson Mandela University George Campus within three different natural resource management programs, namely Agriculture, Nature Conservation, and Forestry. Baseline questionnaires were conducted with 107 students for a baseline assessment as the students entered the university. An online post-intervention questionnaire was conducted with 33 of the initial group of students at the end of the semester for a post-intervention assessment. In-depth semi-structured interviews were conducted with three environmental lectures before they taught their three ecology modules in each of the programs. Additional online semi-structured interviews were also done with the same three environmental lectures after the rapid transition to online teaching and learning took place.

The significant findings from this research were analyzed and discussed. This included the baseline environmental attitudes and knowledge of the student body upon arrival at the university and the changes in their environmental attitudes and knowledge after they were exposed to the ecology modules taught in each of the programs. The discussion also included the teaching approaches adopted by the environmental lecturers and the influence their teaching approaches had on the students' environmental attitudes and knowledge. In addition, the results shed light on the experiences of students and lecturers during the rapid transition to online teaching and learning.

The main conclusions reached were that the first-year School of Natural Resource Management students did not have a deep understanding of ecological concepts prior

to arriving at university, but they did show a concern for the natural environment. Their lack of understanding was reduced as the students progressed with the ecology module. A greater understanding resulted in a change in students' perspectives on the ecological module, their program, and the industry they were preparing to enter after being exposed to the ecology module.

The environmental lecturers' teaching approaches contributed to improving the students' environmental attitudes and knowledge. When it came to the rapid transition to online teaching and learning, both the first-year School of Natural Resource Management students and environmental lecturers experienced benefits and challenges.

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## GLOSSARY OF TERMS

Applied course:	A course by which students learn through the direct application of skills, theories, and models and applying classroom and theoretical learning in real-world settings.
Attitudes:	A student's feelings or opinions about something
Concept:	A principle or idea on a topic
Content:	Information provided on a subject or idea
Course:	Set of lessons for education on a particular subject (e.g., ecology)
Curriculum:	A particular course for study in one specific subject which includes both content and pedagogical approach (e.g., ecology module)
Department:	A part of a university division (e.g., faculty/school groups)
Education:	The process of teaching or learning
Educator:	A person who teaches students
Environmental Education:	The process of teaching or learning about environmental concepts
Environmental field of study:	Studying in an environmentally orientated program
Environmentally orientated:	Directed or interested in the natural environment
Faculty/School:	A group of departments within the university
Higher education:	Education at a university level
Knowledge:	The awareness and understanding that a student possesses about a subject
Module:	A portion of the curriculum focussing on a specific subject (e.g., ecology module)
Online Teaching and Learning:	Education undertaken with the use of services that make use of the internet

Participants:	The first-year SNRM students and three environmental lecturers partaking in the research
Primary Education:	Education at a primary level
Program:	The learning content of the modules within the course
Research:	A detailed investigation of a topic
Secondary Education:	Education at a school level including Primary and Pre-school
Semester:	The halfway point of the academic year
Student:	A person who is studying at school or university.
Syllabus:	A plan that shows the content that will be studied in a particular course
Teaching approach:	The way in which educators teach.
Topic:	Concepts that are discussed, studied, or written about

Some definitions for the terms were sourced from the Cambridge Dictionary (2021).

## ACRONYMS

AMP	Agriculture Management Program
BAS	Baseline Agriculture student
BFS	Baseline Forestry student
BNS	Baseline Nature Conservation student
COVID	Corona Virus disease
EE	Environmental Education
EEASA	Environmental Education Association of Southern Africa
FP	Forestry Program
LTSM	Learner Teacher Support Material
L1,2,3	Lecturer One, Two, And Three
NCP	Nature Conservation Program
NEEP	National Environmental Education Program
NGO	Non-governmental organization
NMU	Nelson Mandela University
OTL	Online teaching and learning
PAS	Post Agriculture student
PFS	Post Forestry student
PNS	Post Nature Conservation student
REC-H	Human Ethics Committee-Human
SA	South Africa
SNRM	School of Natural Resource Management



WP

White Paper

WP EE

White Paper on Environmental Education

## CHAPTER 1: INTRODUCTION

The purpose of environmental education (EE) is to foster awareness and concern for the economic, social, political, and ecological interrelationships in urban and rural areas. EE also provides students with opportunities to attain the knowledge, values, attitudes, commitment, and skills needed to protect and improve the environment. Additionally, EE can produce new patterns of behaviour in individuals, groups, and society as a whole towards the environment (United Nations Educational Scientific and Cultural Organization, 1977).

The South African education systems are not always well equipped to initiate EE successfully. Environmental educators might not have the appropriate learning materials, time, knowledge, and or skills to successfully implement EE into their courses and curriculums (Makokotlela, 2016). Additionally, students may also not have access to resources to successfully engage in EE. This is especially true in the context of the South African Corona Virus Disease-19 (COVID-19) pandemic, where institutions had to transition to online teaching and learning (OTL) approaches and where many students struggled to access learning materials online. Both students and educators were faced with OTL challenges, including a lack of suitable resources or equipment to adequately engage with OTL, or they were not able to quickly adapt to new teaching and learning approaches (Mathiba, 2020; Pragholapati, 2020; Verawardina et al., 2020). All these factors can play a role in the development of students' environmental attitudes and knowledge.

Many researchers (Al-Naqbi & Alshannag, 2018; Norhaidah & Idros, 2006; Ramadhan et al., 2019; Schuch & Henriksen, 2013; Wallen et al., 2019) looked at the role that formal education has on students' environmental attitudes and knowledge. Schuch & Henriksen (2013) concluded that the knowledge EE students receive in school is insufficient and does not provide students with adequate environmental attitudes and knowledge to be more environmentally aware and sustainable. In contrast, Al-Naqbi & Alshannag (2018) found that the knowledge EE students receive in school is sufficient in developing their environmental attitudes and knowledge.

EE offered at schools is diversely ranged, meaning that some schools may be better equipped than others when it comes to integrating EE into their curriculum. Ramadhan et al. (2019) looked at the effectiveness of the teaching approaches of new and upcoming environmental educators at the Universitas Negeri Padang and concluded that their environmental knowledge was not always adequate to be able to teach EE. With regards to higher education institutions, Al-Naqbi & Alshannag (2018) looked at the environmental attitudes and knowledge of university students. They found that students had strong positive environmental attitudes and a good understanding of EE. Additionally, Wallen et al. (2019) found that, as students got more exposure to EE, they developed less positive environmental attitudes, although they had a good understanding of EE.

Both Al-Naqbi & Alshannag (2018) and Wallen et al. (2019) considered environmental attitudes and knowledge of university students and concluded that educators needed to adapt their teaching approaches to be more innovative. In other words, environmental educators should try to focus on new multidisciplinary approaches when teaching EE (Norhaidah & Idros, 2006). A multidisciplinary approach is a curriculum integration that combines different disciplines and diverse perspectives to explain a topic. This approach combines different types of content from other fields of study in the curriculum (International Bureau of Education, 2016). A multidisciplinary approach provides students with a multidisciplinary curriculum where they form a diversity of viewpoints and understandings about a topic.

Researchers (Al-Naqbi & Alshannag, 2018; Norhaidah & Idros, 2006; Ramadhan et al., 2019; Schuch & Henriksen, 2013; Wallen et al., 2019) have identified that there is a need to gain a greater understanding of students' environmental attitudes and knowledge and how they are developed through education systems. Existing research on students' environmental attitudes and knowledge are varied in terms of topics and focus. To obtain a good understanding of how students' environmental attitudes and knowledge are developed through education systems requires researchers to look at both students and educators.

My research aimed to add to the existing literature on students' environmental attitudes and knowledge by looking at the baseline environmental attitudes and

knowledge of first-year university students at Nelson Mandela University (NMU)'s School of Natural Resource Management (SNRM) and how they change as the first semester progresses. Additionally, this research also intended to shed light on the impact of the COVID-19 pandemic on both students and educators at NMU George Campus.

### **1.1. Purpose of the research**

The purpose of this research was to gain a better understanding of first-year SNRM students' environmental attitudes and knowledge, which may help with the development of SNRM undergraduate programs and to best provide EE for students who have diverse backgrounds, attitudes, and knowledge related to the natural environment. My research was designed to achieve this by understanding the impact of EE on the development of environmental attitudes and knowledge of students and how the teaching approaches of environmental educators influenced student environmental attitudes and knowledge. I also aimed to understand the impact of a rapid transition to OTL on students and educators to contribute to existing literature.

My research was case study specific and thus provided a narrative of the NMU George Campus' first-year SNRM students' environmental attitudes and knowledge, the SNRM environmental educators' teaching approaches, and how a rapid transition to OTL influenced both the students and environmental educators. The research also intended to inform the SNRM about their first-year students' baseline environmental attitudes and knowledge and how it changed over the first semester.

By considering the teaching approaches of the environmental educators, this research planned to shed light on their present-day EE practices. This could provide the SNRM with insights into the types of teaching approaches that their environmental lecturers offer, which can contribute to the development of first-year SNRM students' environmental attitudes and knowledge. Additionally, the SNRM environmental educators could use this research to develop or strengthen their teaching approaches to provide their students with the most appropriate learning outcomes, as determined by the SNRM.

In respect of the rapid transition to OTL, I planned to provide the program coordinators at the NMU George Campus and the SNRM with a better understanding of how the rapid transition to OTL impacted both the first-year SNRM students and their environmental educators. This information could be used to better develop OTL approaches and methods used by the university and educators in the future.

## **1.2. Research questions and objectives**

This research aimed to understand the first-year SNRM students' baseline environmental attitudes and knowledge and how they changed through an educational intervention, namely an ecology module. The teaching approaches adopted in the ecology module could influence the changes in environmental attitudes and knowledge. Thus, the research also aimed to identify the educators' teaching approaches and how they influenced the first-year SNRM students. Due to the pandemic of COVID-19, this research additionally aimed to understand how a rapid transition to OTL impacted both the first-year SNRM students and three environmental lecturers.

This research asked: What were the baseline environmental attitudes and knowledge of first-year SNRM students and how did they change during the course of an ecological module? A second research question, developed when the COVID-19 pandemic required the NMU George Campus to rapidly transition to OTL, asked: What were the first-year SNRM students' and three environmental lecturers' experiences with having to transition to OTL?

The objectives that were developed to help answer the two key questions of this research included to:

1. Establish an understanding of the baseline environmental attitudes and knowledge of first-year SNRM students who were undertaking one of three SNRM ecological modules.
2. Assess the changes in the first-year SNRM students' environmental attitudes and knowledge after the education intervention, namely an ecological module.
3. Understand what type of teaching approaches were used by three environmental lecturers teaching the ecological modules.

4. Evaluate how the teaching approaches of the three environmental lecturers influenced the baseline environmental attitudes and knowledge of the first-year SNRM students.
5. Understand the experiences of first-year SNRM students and the three environmental lecturers in transitioning to online teaching and learning.

The structure of my thesis consists of a literature review chapter that provides a brief history of EE and how it is implemented in formal education systems today. The literature review reflects on the research that has taken place about EE and its impact on students' environmental attitudes and knowledge and, in the process, intends to identify the gaps in understanding of developing students' environmental attitudes and knowledge through EE. The literature review also considers the effects of the COVID-19 pandemic and elaborates on the role of OTL in education, the benefits and challenges associated with it, and the impact that a rapid transition to OTL had on both students and educators.

Following the literature review is the case study chapter, which elaborates on the study population at the NMU George Campus. The study population consisted of first-year SNRM students who enrolled for the Agriculture Management Program (AMP), the Forestry Program (FP), and the Nature Conservation Program (NCP), and three environmental lecturers who taught the first-year ecology module within the three programs. The chapter provides a brief history of the NMU George campus and continues by describing why I chose the three SNRM programs for this research. I elaborate on the ecology modules associated with each program as they serve as education interventions whereby, I can understand the changes in the first-year SNRM students' environmental attitudes and knowledge. In addition, the chapter also explains how NMU approached the rapid transition to OTL.

The next chapter details the methods I used for this research. The methods chapter starts with an explanation of the research approach and follows with the role I took as the researcher. The chapter continues by explaining my intended triangulation approach for my data prior to COVID-19 and how I had to re-adjust my approach to a concurrent triangulation design after COVID-19. The concurrent triangulation design was the ideal approach to understand my research problem and answer my research

questions after amendments were made to the research. Following this, the chapter discusses the two sampling strategies, namely stratified random- and purposive sampling that were used to guide the data collection (Cohen et al., 2013). The chapter continues by describing the population sample size and data gathering methods which made use of two research tools, namely questionnaires and semi-structured interviews. Additionally, I explain how these research tools were impacted by COVID-19 and how they were amended for an online approach. Following this, I elaborate on the approach to data analysis, which was content analysis and descriptive statistical analysis. A content analysis was undertaken using the Atlas.ti software for qualitative analysis (Atlas.ti 2021). Descriptive statistical analysis was undertaken in Excel in the form of tables and graphs (Cohen et al., 2013). The methods chapter then explains the trustworthiness and limitations of this research. Finally, the chapter concludes with a discussion of the ethical considerations that this research adhered to by explaining the ethical procedures and clearance that was obtained, both prior to COVID-19 and after.

Chapter Five and Chapter Six follow the methods chapter and elaborate on the results obtained through this research. Chapter Five focuses on the first-year SNRM students' baseline environmental attitudes and knowledge and how these changed, whereas Chapter Six elaborates on three environmental lecturers' perspectives on EE. Both chapters also look at the experiences that both the first-year SNRM students and three environmental lectures had with a rapid transition to OTL.

The results are condensed and discussed in Chapter Seven in relation to the reviewed literature. I focussed on understanding the first-year SNRM students' baseline environmental attitudes and knowledge and how they changed; understanding how the teaching approaches of the three environmental lecturers influenced the first-year SNRM students' environmental attitudes and knowledge; and understanding the influence of the rapid transition to OTL.

Finally, the concluding chapter draws out the key findings of this research. The chapter identifies the contributions and contradictions found in the results in relation to the literature review. Additionally, the chapter provides recommendations for future research on the topic and recommendations for program coordinators at NMU George

Campus and the staff of the SNRM, specifically. Lastly, I end the thesis with a personal reflection of my research journey.



## **CHAPTER 2: LITERATURE REVIEW**

In this chapter, I present an overview of the literature relevant to the research. First, I provide a brief history of environmental education and how it was developed and introduced into formal education systems globally and then, more specifically, to South Africa. I then explain the implications of COVID-19 on education systems. Following this, I focus on the role of EE in developing students' environmental attitudes and knowledge and on OTL in education systems. I use the literature to highlight how EE impacts environmental attitudes and knowledge, how these attitudes and knowledge are established at school level, and how they are further developed at university level. I use the literature to explain how OTL contributes to education and explain why OTL is considered as a teaching approach and method in education systems. I highlight the benefits and challenges derived from adopting an OTL approach and discuss how a rapid transition to OTL impacts education systems. In particular, I use the literature to highlight how a transition to OTL affects applied learning, such as used in EE.

### **2.1. The history of environmental education**

Environmental education is a science-based multi-disciplinary subject that embraces ecological knowledge and the understanding of the natural environment, people-environment relationships, ethics, politics, culture, sociology, and public participation in decision making (Carter & Simmons, 2010; Eneji et al., 2017). It focuses on the study of nature, education for conservation, education about the outdoors, and education for sustainable development, and can be used to inform students about how the natural environment works and how to manage and protect it. The purpose of EE is to help students become more aware of the natural environment by developing their environmental awareness, knowledge, and behaviours (Boca & Saraçlı, 2019; Eneji et al., 2017; Joy & Philip, 2003; Ramadhan et al., 2019). At its core EE concentrates on teaching students about the natural environment and the relationship between the environment, organisms, and humans (Eneji et al., 2017).

EE is implemented at various education levels, including schools and universities, and is used more broadly to educate societies and communities about the natural

environment (Eneji et al., 2017), both formally and informally. EE is still a relatively new form of education (Eneji et al., 2017). Many of the developments in the field of EE took place during the 1970s with the definition of EE itself only originating in 1975.

### ***2.1.1. The global history of environmental education***

The focus on the protection and management of the environment started as early as 1948 when the conference for the establishment of the International Union for the Protection of Nature, arranged at Fontainebleau, France, emphasized the priority of protecting the natural environment (Carter & Simmons, 2010; Eneji et al., 2017; United Nations Educational Scientific and Cultural Organization, 1948). Various other conferences proceeded to ensure the protection and management of the environment, but it was only in the 1970s that EE was advocated as an approach to ensuring the protection and management of the environment continued.

The definition and development of EE originated from a vast history of conferences, movements, authors, and legislations. There was an international turning point for EE in 1972 when the first United Nations Conference on the Human Environment proceeded in Stockholm, Sweden. The conference provided a declaration of 26 principles, with principle 19 specifically focusing on “*education in environmental matters, for the younger generation as well as adults*” (United Nations Environment Programme, 1972, p5). According to Carter & Simmons (2010), the 1972 Stockholm conference indicated the importance and the need for EE on an international level. Eneji et al. (2017) add that the conference declared that EE should be used as a tool to address global environmental challenges.

In 1975, the International Workshop on Environmental Education was held in Belgrade, Yugoslavia. The result of this workshop was the development of the Belgrade Charter, which added to the Stockholm framework (Carter & Simmons, 2010; Joy & Philip, 2003; McCrea, 2006). From this, the first definition of environmental education was established, describing the goals, objectives, audiences, and initial guiding principles of EE. The UNESCO formally defined EE as:

*A process aimed at developing a world population that is aware of and concerned about the total environment and its associated problems, and*

*which has the knowledge, attitudes, motivations, commitments, and skills to work individually and collectively toward solutions of current problems and the prevention of new ones (Carter & Simmons, 2010, p8).*

The goal was to develop a world population with environmental awareness and the necessary knowledge and skills to individually and collectively solve and prevent environmental problems (United Nations Educational Scientific and Cultural Organization, 1975, p3). To achieve this goal several objectives were formulated. These included:

*Awareness: to help social groups and individuals acquire an awareness and sensitivity to the total environment and its allied problems.*

*Knowledge: to help social groups and individuals gain a variety of experience in, and acquire a basic understanding of, the environment and its associated problems.*

*Attitudes: to help social groups and individuals acquire a set of values and feelings of concern for the environment and the motivation for actively participating in environmental improvement and protection.*

*Skills: to help social groups and individuals acquire the skills for identifying and solving environmental measures*

*Evaluation ability: to help individuals and social groups evaluate environmental measures and education programs in terms of ecological, political, economic, social, esthetic and educational factors.*

*Participation: to provide social groups and individuals with an opportunity to be actively involved at all levels in working toward resolution of environmental problems. (United Nations Educational Scientific and Cultural Organization, 1975, p3-4).*

The audiences for EE were deemed to be:

*The formal education sector: including pre-school, primary, secondary and higher education students as well as teachers and environmental professionals in training and retraining;*

*The non-formal education sector: including youth and adults, individually or collectively from all segments of the population, such as the family, workers, managers and decision makers, in environmental as well as non-environmental fields. (United Nations Educational Scientific and Cultural Organization, 1975, p4).*

The UNESCO EE goals were later further developed, along with the objectives to better foster an environmentally aware population, at the Intergovernmental Conference on Environmental Education in 1977, held in Tbilisi, Georgia. In the 1977 conference, the role of EE was emphasized and the Tbilisi Declaration was formulated, which provided a design of EE (Carter & Simmons, 2010; Joy & Philip, 2003; McCrea, 2006). The Tbilisi Declaration set out the goals, objectives, and guiding principles for EE, which are still used by environmental educators today (Joy & Philip, 2003; McCrea, 2006). The goals for EE as set out in the Tbilisi Declaration include:

*(a) To foster clear awareness of, and concern about, economic, social, political and ecological interdependence in urban and rural areas;*

*(b) To provide every person with opportunities to acquire the knowledge, values, attitudes, commitment and skills needed to protect and improve the environment;*

*(c) To create new patterns of behaviour of individuals, groups, and society as a whole towards the environment. (United Nations Educational Scientific and Cultural Organization, 1977, p26).*

The EE objectives set out in the Tbilisi Declaration remained predominantly unchanged. The only change was for the evaluation ability in the previous UNESCO goals of developing an environmentally aware population in 1975 that was removed from the new set of EE objectives.

The guiding principles for EE set out in the Tbilisi Declaration were:

*Environmental education should:*

- *consider the environment in its totality—natural and built, technological and social (economic, political, cultural-historical, ethical, esthetic);*
- *be a continuous lifelong process, beginning at the preschool level and continuing through all formal and nonformal stages;*
- *be interdisciplinary in its approach, drawing on the specific content of each discipline in making possible a holistic and balanced perspective;*
- *examine major environmental issues from local, national, regional, and international points of view so that students receive insights into environmental conditions in other geographical areas;*
- *focus on current and potential environmental situations while taking into account the historical perspective;*
- *promote the value and necessity of local, national, and international cooperation in the prevention and solution of environmental problems;*
- *explicitly consider environmental aspects in plans for development and growth;*
- *enable learners to have a role in planning their learning experiences and provide an opportunity for making decisions and accepting their consequences;*
- *relate environmental sensitivity, knowledge, problem-solving skills, and values clarification to every age, but with special emphasis on environmental sensitivity to the learner's own community in early years;*
- *help learners discover the symptoms and real causes of environmental problems;*
- *emphasize the complexity of environmental problems and thus the need to develop critical thinking and problem-solving skills;*

- *utilize diverse learning environments and a broad array of educational approaches to teaching, learning about and from the environment with due stress on practical activities and first-hand experience. (United Nations Educational Scientific and Cultural Organization, 1977, p27).*

Following the Tbilisi Declaration, the National Leadership Conference on Environmental Education of 1978 was held in Washington, D.C. A report “*From Ought to Action*” was created (McCrea, 2006), which addressed EE for elementary education, secondary education, and higher education (Eneji et al., 2017).

Further developments were made in EE during 1992 at the United Nations Conference on Environment and Development held in Rio De Janeiro. From this conference emerged Chapter 36 of Agenda 21, which was an action program set out to re-orientate EE towards sustainable development, increase the communities’ awareness of the environment, and promote training to develop and facilitate sustainable living (Joy & Philip, 2003; McCrea, 2006; ONGO, 2006).

In 2002 the World Summit on Sustainable Development held in Johannesburg, South Africa (SA), was held to further the debate on sustainable development. The summit discussed issues about the environment and development (Joy & Philip, 2003; McCrea, 2006). Directions and actions were needed to achieve the goals for sustainable development. In 2005, a declaration for Education for Sustainable Development was made by the United Nations (Joy & Philip, 2003) which placed education at the forefront as a pathway to achieve sustainable development.

#### Legislation contributing to the global history of environmental education

Prior to the developments in EE emanating from the various conferences that took place in the 1970s, a range of American legislation reflected concerns with humans’ relationship with the natural environment (Carter & Simmons, 2010). This included the Wilderness Act of 1964, the Species Conservation Act of 1966, and the Wild and Scenic River Act of 1968, all of which highlighted concerns about the relationship between the environment and what humans might be doing to it (Carter & Simmons, 2010, p6). Furthermore, the Solid Waste Disposal Act of 1965 and the Clean Air Act

of 1965 considered human waste and emissions and how they affected the American environment (Carter & Simmons, 2010, p6).

The National Environmental Policy Act (NEPA) of 1969 considered and aimed to protect the quality of the environment, which included the natural environment, in terms of air, water purity, pollution, and noise. Pollution and noise were an increased concern during the 1960s. NEPA of 1969 remains the major environmental law for environmental quality in America (Carter & Simmons, 2010). The purpose of the NEPA was:

*To declare a national policy which will encourage productive and enjoyable harmony between man and his environment; to promote efforts which will prevent or eliminate damage to the environment and biosphere and stimulate the health and welfare of man; to enrich the understanding of the ecological systems and natural resources important to the Nation; and to establish a Council on Environmental Quality. (National Environmental Policy Act, 1969, p1).*

Another revolutionary movement for EE occurred when the National Science Teachers Association, which consisted of EE coordinators in schooling systems of 50 U.S. states, came together to express the need for program and curriculum development for EE (Carter & Simmons, 2010; Eneji et al., 2017; McCrea, 2006). The movement brought about the Environmental Education Act of 1970. The Western Regional Environmental Education Council, which became the Council on Environmental Education, was established soon after. The Council on Environmental Education directed the development of EE curriculum materials, created partnerships, and networks, and congregated natural resource professionals to support the efforts of EE (Carter & Simmons, 2010; Eneji et al., 2017) in America. Subsequently, the National Environmental Education Act (NEEA) of 1990 recognized the crucial role of EE in efforts to conserve and protect nature. The Act successfully integrated EE into the American schooling system, at elementary, primary, and secondary school levels (Eneji et al., 2017; Joy & Philip, 2003). EE has been a part of the American schooling curriculum since NEEA, which guides EE in the United States of America today.

### Authors contributing to the global history of environmental education

Various authors contributed to the development and role of EE. Authors such as John Muir (1838 - 1914), Enos Mills (1870 - 1922), Robert Marshall (1901 - 1939), and Aldo Leopold (1887 - 1948) who steered the early debates on the natural environment (Carter & Simmons, 2010; Eneji et al., 2017). However, these authors limited the expression of their concerns to human relationships with the natural environment, resource preservation and conservation, and the protection of the environment. They did not explore the human-nature-environment relationship in terms of topics such as environmental quality, and humans' awareness, attitudes, or knowledge about the environment (Carter & Simmons, 2010; Eneji et al., 2017). Early debates and in-depth discussions on the human-nature-environment relationship started with authors such as John Kenneth Galbraith (1908 - 2006) and Vance Packard (1914 - 1996).

Two outstanding authors that greatly contributed to the debate on environmental problems and instigated a more environmentally aware public were Rachel Carson (1907 - 1964) who wrote the book *"Silent Spring"* published in 1962, and Stewart Udall (1920 - 2010) who wrote the book *"The Quiet Crisis"* published in 1963 (Carter & Simmons, 2010; Eneji et al., 2017). These publications shaped the movements and conferences that lead to the development of EE as it is known today.

#### **2.1.2. History of environmental education in South Africa**

Various policies and initiatives contributed to the development and implementation of EE in SA. Environmental education in SA quickly gained momentum after the Tbilisi Declaration in 1977. Before this, EE had its roots in systems such as wilderness leadership schools, the Wildlife Society of Southern Africa, and national parks, which together educated people about the natural environment in the 1960s (De Lange, 2004). The Wildlife Society's Umgeni Valley Project started in Natal in 1973, providing the foundation and model for the development of EE in SA (De Lange, 2004). The National Environmental Awareness Council was established in Soweto in 1974, which recognized the need for research priorities in EE (De Lange, 2004).

In 1982, the Environmental Education Association of Southern Africa (EEASA) was founded at a national conference on environmental education held at Treverton



College in Natal. This conference was attended by both environmentalists and environmental educators (De Lange, 2004; Environmental Education Association of Southern Africa, 2017) and was the initial step taken in the country to better equip citizens with environmental education, as a response to combat environmental problems (Environmental Education Association of Southern Africa, 2017). Soon after this, in 1985, a committee that was responsible for developing and promoting EE in formal and non-formal environments was formed by EEASA (De Lange, 2004).

In 1989, the White Paper on Environmental Education (WPEE) was published and was the first effort to include EE in formal education systems in SA (De Lange, 2004; Deenanath, 2004; Le Grange, 2002). According to Deenanath (2004), the WPEE included the guidelines from the Stockholm framework (1975) and the Tbilisi principles (1977). However, Le Grange (2002) mentions that the WPEE was not endorsed by the South African parliament nor was it broadly integrated into formal education systems. Thus, EE was not well implemented in formal education systems in the country prior to and in the early 1990s. EE became more integrated into formal education systems when the Environmental Education Policy Initiative was formulated in 1992. This policy initiative gathered and developed environmental education policy options for formal education systems in SA (De Lange, 2004; Deenanath, 2004; Le Grange, 2002), leading to a national focus on EE being declared in SA's White Paper (WP) on Education and Training in 1995.

The WP of 1995 set out several national policies that highlighted the importance of EE and guided the development of EE in the country (De Lange, 2004; Department of Education, 1995). SA's WP on Education and Training drew from the following policies previously established for EE: The United Nations Conference on Environment and Development, Agenda 21 of 1992, Reconstruction and Development Program Document of 1994 (a piece of SA legislation), and the South African Constitution/Bill of rights of 1996. The year 1996 brought additional developments in EE as there was a shift from national education policy development to a learner-centered curriculum development, including the incorporation of EE (De Lange, 2004). Following this, EE was officially introduced into the formal education curriculum in 1977 with the Curriculum 2005 Initiative, introduced by the Minister of Education (Deenanath, 2004;

Le Grange, 2002; Makokotlela, 2016). The Curriculum 2005 initiative set out to replace content-based education with outcomes-based education and teacher-centered teachings with more learner-centered teachings (Le Grange, 2002). After this initiative, EE in SA's education system was formally embedded in the curriculum.

In 2001, the National Environmental Education Program was established, which resulted in a national environmental education initiative. In 2005, the Department of Education developed a new curriculum that included EE (Department of Environmental Affairs and Tourism, 2001). This curriculum was based on the learner-centered curriculum for teaching and learning that was established in 1996, which followed the Environmental Education Policy Initiative of 1993 to 1995 and the Environmental Education Curriculum Initiative of 1996 (De Lange, 2004). These advances contributed to the development of EE that students currently receive across all levels of education, especially at schools and universities, in South Africa.

#### Legislation contributing to the history of environmental education in South Africa

Various Acts were established during the development of EE in SA. De Lange (2004) mentions that the WP of 1980 was listed as the Environmental Conservation Act of 1982. Following this, several subsections within the WP were established, such as WPEE of 1989, the WP on the National Water Policy of 1997, the WP on the Development and Promotion of Tourism of 1996, the WP Environmental Management Policy for South Africa of 1997, the draft WP on Integrated Pollution and Waste Management, the National Waste Management Strategy of 1998, and the Government WP on Education and Training of 1995 (De Lange, 2004).

Further legislation focused on addressing environmental issues in SA (Makokotlela, 2016). These Acts included the Water Services Act of 1997, which provided the rights of access to basic water supply and basic sanitation (Republic of South Africa, 1997); the Marine Living Resources Act of 1998, which contributed to the conservation of the marine ecosystem, long-term sustainable utilisation of marine living resources, utilisation and protection of certain marine living resources, and the exercise of control over marine living resources (Republic of South Africa, 1998a); the National Environmental Management Act of 1998, which aimed to prevent pollution and

ecological degradation, and to ensure sustainable development (Republic of South Africa, 1998b); the Biodiversity Act of 2004, which provided for the management and conservation of South Africa's biodiversity (Republic of South Africa, 2004b); the National Environmental Management: Air Quality Act of 2004, which provided the national norms and standards regulating air quality monitoring (Republic of South Africa, 2004a); the Electricity Regulation Act of 2006, which established the national regulatory framework for the electricity supply industry (Republic of South Africa, 2006); and the National Environmental Management: Waste Management Act of 2008, which provided for waste management measures, control of waste management activities, and national waste information systems (Republic of South Africa, 2013). The concern for the environment expressed in these Acts promoted public participation in environmental decision-making and further enhanced the need for an informed public involvement in environmental management.

#### Collaborations contributing to the history of environmental education in South Africa

Multiple non-governmental organizations collaborated with EEASA to develop the practice of EE in SA. A few of the non-governmental organizations that made a significant contribution to and collaborated with EEASA were the Wilderness Leadership School, the Wildlife and Environment Society of SA, and the Worldwide Fund Zambia (Environmental Education Association of Southern Africa, 2017). Various educational institutions also collaborated with EEASA to develop the practice of EE in SA. There are also nine institutions that have a close working relationship with the EEASA, including Rhodes University, the University of Stellenbosch, and the University of SA (Environmental Education Association of Southern Africa, 2017).

The development and implementation of EE in SA were intended to create more environmental awareness and concern in the country's communities. The history of EE in SA has been embedded in political, economic, and social systems across the country (De Lange, 2004). However, this does not mean that EE is always effectively incorporated into formal education systems. The success of EE often depends on the learner teacher support material (LTSM) offered by formal education systems.

## **2.2. Contemporary environmental education**

Although EE has been integrated into the formal education curriculum, it is not always well executed. The purpose of EE is to educate students in becoming more aware of the natural environment (Boca & Saraçlı, 2019) in terms of developing students' environmental awareness, knowledge, and behaviours (Boca & Saraçlı, 2019; Joy & Philip, 2003; Ramadhan et al., 2019). This is the ideal outcome for EE, but South African schools are not always able to achieve the purpose of EE. Makokotlela (2016) explains that the concepts of EE are not always easy to implement into teaching and learning practices, mainly due to a lack of adequate resources. This is especially true for some of the country's communities as not every school or student has access to LTSM, particularly in terms of EE (Conde & Samuel Sánchez, 2010; Makokotlela, 2016). The success of EE at schools and universities is dependent on the quality and availability of LTSM. However, LTSM is not the only reason for a lack of effective EE in formal education systems. Environmental educators often do not have the time, resources, knowledge, and/or skills to develop EE learning resources (Makokotlela, 2016; Tovar-Gálvez, 2021). This ultimately has an effect on the environmental teaching and learning that students receive.

There is a need to gain a greater understanding as to what students' environmental attitudes and knowledge are and how they are developed through education systems, as identified by researchers such as Al-Naqbi & Alshannag (2018), Boca & Saraçlı, (2019), Norhaidah & Idros (2006), Schuch & Henriksen (2013), and Wallen et al., (2019). This need for a greater understanding of students' environmental attitudes and knowledge is linked to my research questions and the reason behind conducting said research.

### ***2.2.1. Teaching environmental education in formal education systems***

The way in which students are taught about the environment plays an important role in making an impact on their environmental attitudes and knowledge. Environmental educators, specifically, have the potential to develop students' environmental consciousness and attitudes to become more environmentally aware, knowledgeable, and to be able to collectively solve and prevent environmental problems (Marques &

Xavier, 2020; Ramadhan et al., 2019; United Nations Educational Scientific and Cultural Organization, 1975) who will one day make a positive contribution to communities and societies (Boca & Saraçlı, 2019). Developing students' environmental consciousness, knowledge and attitudes are fundamental in establishing their environmental awareness, knowledge, and skills. Additionally, if environmental educators want to influence their students' environmental attitudes, they need to facilitate the development of students' knowledge about the environment (Norhaidah & Idros, 2006; Ramadhan et al., 2019). Environmental educators must also be equipped with environmental knowledge and skills in order to facilitate the development of environmental awareness, knowledge, attitudes, and understanding in students. This will enable environmental educators to encourage students to actively participate in conserving the natural environment (Ramadhan et al., 2019). The effectiveness of the educators' EE curriculum is also key to influencing a greater number of students, at both schools and universities.

### ***2.2.2. The syllabus for environmental education***

The way in which environmental educators teach EE can be complicated as there are various threads in which EE can be presented in the curriculum. Joy & Philip (2003) elaborate on three threads that can be used when developing EE curricula, namely teaching about, from, or for the environment. Teaching about the environment refers to the concepts of the natural environment itself, teaching from the environment utilizes the natural environment as a teaching and learning environment, and teaching for the environment aims to develop a concern for the natural environment (Joy & Philip, 2003). The challenge that environmental educators are faced with is developing and establishing an EE program that promotes environmental attitudes and knowledge (Carter & Simmons, 2010).

Integrating EE into formal education systems is not an easy task. Conde & Samuel Sánchez (2010) explain that EE requires a coherent approach from all involved in education at formal education systems, namely schools and universities. Courses that focus on EE need to consider how they develop their curriculum. EE programs should be designed to help students adopt sustainable practices (Singh, 2017); address present and future environmental challenges (Balsiger et al., 2017; Chan, 2016); and

develop environmental policies, and engage and adapt to mitigating environmental problems (Schuch & Henriksen, 2013).

Promoting environmental attitudes and knowledge into the EE curriculum is not easily accomplished. This is especially true for education systems in SA, specifically schools and universities. Education systems in SA are not always able to provide equal access to education for their students. Lack of resources, such as LTSM, or a lack of knowledge of many educators about EE is often the reason for unequal access to education (Makokotlela, 2016; Ramadhan et al., 2019; Tovar-Gálvez, 2021). An additional challenge to maintain a balance in EE arises when having to rapidly adapt LTSMs for OTL approaches, due to a worldwide pandemic.

According to researchers such as Joy & Philip (2003) and Ramadhan et al. (2019), there is a need to gain a better understanding of how teaching approaches of EE educators contribute to the development of students' environmental attitudes and knowledge.

### ***2.2.3. The classroom environment for environmental education***

EE is used to inform students about how the natural environment works and how they can manage and protect it, ultimately developing students' environmental comprehension and engagement.

The concept of the outdoor classroom has gained momentum within formal education systems (Largo-Wight et al., 2018) as a method to teach students about, from, and for the environment. Using the natural environment as an outdoor classroom can foster and enhance students' attitudes, knowledge, understanding, behaviours, personal development, social development (Dillon et al., 2005), and their engagement with the natural environment (Largo-Wight et al., 2018). Additionally, the outdoor classroom entails working with others in an applied context, developing new skills, and guiding communities and society (Dillon et al., 2005). The SNRM, in this case, teaches EE by combining the indoor and outdoor classroom environment.

For this research, I chose to focus on the classroom context rather than teaching and learning more generally because the modules considered are traditionally offered to a

relatively small group of students in a classroom context. However, the classroom environment was understood more broadly than some traditional views, where it refers to just the physical indoor classroom. Here, it is defined as including both the physical classroom environment (indoor, outdoor, and online) and the psychological environment experienced by the students and their lecturers. More specifically:

- The **indoor classroom** environment in this research refers to the students, lecturers teaching methods and approaches, course content, and room space in terms of the ecological modules for the first semester.
- The **outdoor classroom** environment in this research refers to the first-year SNRM students and three environmental lecturers within a natural setting beyond the built lecture hall or classroom, where applied teaching and experience are gained, within walking distance from the built infrastructure.
- The **psychological classroom** environment in this research is defined as the personal experiences, interactions, and perceptions of the first-year SNRM students and three lecturers teaching the ecology modules.
- The **online classroom** environment is defined as the virtual classroom environment experienced through the internet.

The functioning of the outdoor classroom was affected by COVID-19. Both the first-year SNRM students and the environmental lecturers were no longer able to practically engage with each other in the outdoor classroom environment, as most of the teaching and learning was experienced online after the rapid transition to OTL. The physical classroom and online environment play a role in constructing the personal experience of both lecturers and students. In this research, this refers to the SNRM students and lecturers.

### **2.3. Role of environmental education in students' environmental attitudes and knowledge**

Students enter university with predetermined environmental attitudes and knowledge of environmental concepts. They will either have positive or negative attitudes about the natural environment, influenced by their overall understanding and experiences of it. Multiple researchers (Al-Naqbi & Alshannag, 2018; Norhaidah & Idros, 2006;

Schuch & Henriksen, 2013; Wallen et al., 2019) concur that students who have a good understanding of the natural environment usually show more concern towards it. Students who tend to show concern about the environment will want to contribute to protecting and managing it. The opposite is shown when students lack a good understanding of environmental concepts, as they tend to have a lack of concern about the natural environment (Al-Naqbi & Alshannag, 2018; Schuch & Henriksen, 2013; Wallen et al., 2019).

My research set out to uncover the students' predetermined environmental attitudes and knowledge developed at school which they arrived with when starting their first-year diploma in the SNRM at NMU George Campus. To do so, I needed to determine their baseline environmental attitudes and knowledge.

### ***2.3.1. Environmental education in South African basic education school system.***

Environmental education at South African school levels, particularly primary and secondary school levels, does not always build students' critical thinking around environmental concepts. Multiple researchers (Al-Naqbi & Alshannag, 2018; Schuch & Henriksen, 2013; Wallen et al., 2019) agree that students' knowledge about the natural environment affects and influences their attitudes toward it. These environmental attitudes and knowledge could be shaped through primary and secondary education. Schuch & Henriksen (2013) investigated how knowledge about climate change influenced the attitudes of secondary school children of 16 to 17 years of age in Austria and Denmark. They designed an intervention to study this by introducing a lecture on climate change science to determine a baseline and post-intervention understanding of their student group. They executed their research through a survey in questionnaire form with 188 students before and after the lecture. Schuch & Henriksen (2013) found that after the lecture on climate change students improved their knowledge, but their attitudes on it were not affected. They attribute their findings to the basic information on environmental topics at school, which is not sufficient to create a broad understanding thereof. Schuch & Henriksen (2013) concluded that there is an urgent need to improve EE, specifically climate change science at school levels.



As has been established, students' environmental attitudes and knowledge at university are based on the EE experienced at school. However, this type of education is not always executed appropriately in schools as it has not been successfully integrated into the schooling curriculum (Makokotlela, 2016; Ramadhan et al., 2019; Schuch & Henriksen, 2013). Ramadhan et al. (2019) explored the environmental perspective of language teacher students. Using surveys in questionnaire form, they wanted to determine the students' environmental attitudes, knowledge, and skills as they designed learning materials for EE. Ramadhan et al. (2019) found that the language teacher students needed to improve their environmental knowledge as it was inadequate for them to be able to design learning materials for EE. Ultimately, this would indicate that they were not equipped to adequately incorporate EE into their curriculum (Makokotlela, 2016; Ramadhan et al., 2019).

Students' environmental attitudes and knowledge are found wanting when EE is not appropriately incorporated into the curriculum in the first place. Schuch & Henriksen (2013) elaborated on this in their study, saying that traditional approaches to EE are not enough to influence an environmental attitude and/or change or improve students' understanding of environmental concepts.

Ramadhan et al. (2019) talked about the need to investigate the effectiveness of the teaching approaches of new and upcoming environmental educators and assess whether they are capable of effectively incorporating EE into their curriculum. If environmental educators do not incorporate EE into their curriculum suitably, it could lead to unwanted results. An effective EE curriculum can be associated with students' understanding of the natural environment. This understanding of the natural environment is built upon either personal experiences or environmental educators. According to Joy & Philip (2003), EE should provide students with abilities such as problem-solving, decision making, and decision participation in terms of environmental ecological, political, economic, social, aesthetic, and ethical aspects of sustainability challenges. It is up to environmental educators to promote changes in students' environmental attitudes and knowledge that will aid in the development of the aforementioned skills (Joy & Philip, 2003).

EE at school levels should make suitable provisions for planning and implementing successful EE programs. According to Conde & Samuel Sánchez (2010), the schooling curriculum needs to be amended to incorporate more environmentally sustainable initiatives. Teachers should try their best to practice what they educate their students about, and students must work together towards sustainable practices. Educating students on the basic environmental concepts from a young age is crucial as it contributes to their perception of the natural environment (Schuch & Henriksen, 2013). Students who go into an environmental education field are likely to expand their values and perceptions about their natural environment as these aspects are further built upon at higher levels of environmental education, such as going to university. It is, however, important to realize that students coming out of schools have different baseline environmental attitudes and knowledge, even when EE is not considered as part of their educational background.

### ***2.3.2. Environmental education in South African universities***

Students in SA have different baseline attitudes and environmental knowledge at the start of their university studies. Environmental educators need to be aware of this and build from the students' baseline knowledge and attitudes, which they have developed through their school career or through their own personal experiences. This means environmental educators need to be aware of the background of their students, which can help them to understand their students' environmental attitudes and knowledge. This, in turn, can be used to modify or alter the EE curriculum to better suit students who lack appropriate environmental attitudes and knowledge.

Authors who have discussed students' environmental attitudes and knowledge at a university level include Al-Naqbi & Alshannag (2018), Norhaidah & Idros (2006), and Wallen et al. (2019). Norhaidah & Idros (2006) examined undergraduate students' environmental attitudes, behaviours, knowledge, and understanding at a university in Malaysia. The study used questionnaires to assess the baseline environmental attitudes, knowledge, and behaviours of 313 undergraduate educational students. Norhaidah & Idros (2006) found that students who expressed strong pro-environmental attitudes showed more nuanced ecological insights, although their communicated willingness to act on their environmental attitudes did not reflect in their

actions toward the environment. In other words, there was a disconnect between their environmental attitudes and their willingness to act on environmental issues.

The researchers also considered the teaching approaches of environmental educators, as their approaches to teaching environmental concepts contributed to the change in students' baseline environmental attitudes, knowledge, and behaviours. Norhaidah & Idros (2006) found that teaching environmental concepts alone was not enough to change the attitudes of students towards the natural environment. They also found that the usual lecture approach to EE is limited and that innovative teaching methods are needed when students are required to act and engage in their field. According to Norhaidah & Idros (2006), EE at university should focus on promoting a greater understanding of environmental challenges. It needs to equip students with knowledge, agency, and understanding of the root causes of and the complexity behind sustainability problems.

Al-Naqbi & Alshannag's (2018) research built upon Norhaidah & Idros (2006) work in terms of students' knowledge, attitudes, and behaviours. Al-Naqbi & Alshannag (2018) investigated undergraduate students' knowledge, attitudes, and behaviours toward EE and sustainable development, using a survey of 823 participants. Al-Naqbi & Alshannag (2018) found that the United Arab Emirates University students had a good understanding, strong positive attitudes, and moderate positive behaviour toward EE and sustainable development. The conclusion reached was that students possibly acquired a good understanding of EE and sustainable development during their school years. This implies that EE at school can be sufficient and contradicts the findings of Schuch & Henriksen (2013), who stated that EE at schools is not always sufficient.

As was recommended by other researchers Al-Naqbi & Alshannag (2018), Boca & Saraçlı (2019), Joy & Philip (2003), Norhaidah & Idros (2006); Ramadhan et al. (2019) recommend that EE should build upon students' environmental knowledge, especially at universities. They recommend that it is essential to provide all undergraduate students, specifically environmentally orientated students, with opportunities and courses in EE to improve their environmental attitudes and knowledge. This, however, is a lofty goal proposed by Al-Naqbi & Alshannag (2018), as not all programs at

universities incorporate EE into their curriculum. It also cannot be expected of all programs to incorporate EE if it is not mandatory to do so.

Wallen et al. (2019) also looked at undergraduate students' environmental attitudes and knowledge but narrowed their research to looking at an engineering course offered at both the National Academy of Engineering and the National Academy of Sciences. Wallen et al. (2019) investigated how an environmental engineering course contributed to engineering students' attitudes and knowledge toward environmental issues over 18 months, using a questionnaire to survey 166 participants. Wallen et al. (2019) found that students' environmental knowledge increased as the course progressed, but the students became less positive as they gained more knowledge and understanding about environmental issues. These results contradicted the findings of Al-Naqbi & Alshannag (2018) in so far as not all students who have gained more environmental knowledge have positive environmental attitudes. According to Wallen et al. (2019), the environmental engineering course subject matter made it seem that environmental issues were severe and difficult to solve, ultimately leading to students becoming less positive about the natural environment. Thus, students who have a good understanding of the natural environment can have negative attitudes about it, as they become aware of the complex issues that are involved in its management. This suggests that more research into undergraduate students' environmental attitudes and knowledge, in different programs and disciplines, is needed to create a comparative narrative within the research literature.

Wallen et al. (2019) explain that courses that focus only on environmental challenges and problems impact students' attitudes negatively. However, if the course incorporates and focuses on understanding environmental issues and provides solutions towards them, students' attitudes will be impacted more positively. In addition to what students are taught, the way in which students are taught about the environment also plays a role when it comes to making an impact on their environmental attitudes, knowledge, and behaviours.

### **2.3.3. Approaches to teaching environmental education**

In addition to the work of Norhaidah & Idros (2006) and Ramadhan et al. (2019) with regards to educators' teaching approaches, researchers have elaborated on the traditional and the constructivist teaching and learning approaches. According to Van der Merwe et al. (2007), teaching and learning should encourage and facilitate life-long learning, and education provided by universities should prepare their students to act purposefully in situations within their field of study. This can be achieved by combining two types of teaching and learning approaches, namely teaching about a concept through facts and procedures; and learning-to-be, which requires the application of new knowledge and an active and engaged contribution to the process of generating knowledge (Amory et al., 2008; Van der Merwe et al., 2008). This way of teaching and learning refers to combining the traditional teaching approaches with constructivism. The traditional way of teaching refers to the teacher-centered approach where the educator produces and delivers information to students (Van der Merwe et al., 2008; Blackie et al., 2010). Constructivism refers to knowledge that is constructed by both educators and students through social interactions and individual experiences (Creswell, 2003; Creswell & Poth, 2016; Gill, 2015; Given, 2008; Rahi, 2017), which implies that students construct new understandings and knowledge as they progress with their education.

The constructivist teaching and learning approach is more student-centred, concentrating on how the student understands the material (Blackie et al., 2010). Student-centered teaching often requires teachers to move from the known to the unknown and to gradually build on already existing student knowledge. This involves ensuring that all students are on the same level of understanding before progressing with the module content within a program. This type of teaching and learning approach is referred to as scaffolding (Glossary of Education Reform, 2015).

## **2.4. The impact of COVID-19 on the education sector**

COVID-19, a strain of the Coronavirus, is a respiratory disease that affected many countries in 2020. The European Centre for Disease Prevention and Control (2020) provided the following background on the spread of COVID-19. The Wuhan Municipal

Health Commission in Wuhan City, Hubei province, China first reported the virus on the 31<sup>st</sup> of December 2019. On the 20<sup>th</sup> of January 2020 reports on the spread of the virus to Thailand, Japan, and South Korea were confirmed, with a city lockdown for Wuhan being implemented on the 23<sup>rd</sup> of January 2020. France reported its first cases of COVID-19 on the 24<sup>th</sup> of January 2020 and Germany on the 28<sup>th</sup> of January 2020. The World Health Organization declared a “*public health emergency of international concern*” in relation to the COVID-19 outbreaks on the 30<sup>th</sup> of January 2020. Italy reported its first cases on the 22<sup>nd</sup> of February 2020, with European countries confirming more cases over the following days. European countries enforced health measures and social distancing nationwide on the 11<sup>th</sup> of March 2020. On the same day, the World Health Organization Director-General declared COVID-19 a global pandemic. From the 25<sup>th</sup> of March 2020, over 150 countries were affected.

South Africa confirmed its first case of COVID-19 on the 5<sup>th</sup> of March 2020 (National Institute for Communicable Diseases, 2020). On the 23<sup>rd</sup> of March 2020, the President of South Africa declared a three-week nationwide lockdown. The lockdown was set to start at midnight on the 26<sup>th</sup> of March 2020, with severe restrictions on traveling and freedom of movement (COVID-19 South African Online Portal, 2020). International and provincial borders were closed in an attempt to reduce the rate of infections in South Africa. The President of South Africa extended the nationwide lockdown for an additional three weeks on the 9<sup>th</sup> of April 2020. On the 23<sup>rd</sup> of April 2020, the President of South Africa addressed the country and introduced 5 lockdown levels for the country. The universities across the country had to adapt quickly to these new regulations.

The nationwide lockdown in SA not only halted economic activities across the country but also the teaching activities of educational institutions. Schools and universities had to shut down various operations. For universities, in particular, it meant shutting down class contact, graduation ceremonies, conferences, and workshops (Mathiba, 2020). In order to complete the academic year, many schools and universities had to rapidly transition to OTL strategies. This provided many challenges for both students and educators who were not familiar with, or ready to adapt to, an online approach. When the restrictions eased and some classes were permitted, many students were unable

to access the learning environment and had limited communication with their respective lecturers.

The challenges that students and educators faced included having a lack of resources, not being able to access resources, faulty or poor equipment, and having to adapt to new teaching and learning approaches and methods (Mathiba, 2020; Praghlapati, 2020; Verawardina et al., 2020). Although some students may have had access to OTL, the evaluation processes (including summative assessments like exams) became a challenge and required adaptation. The challenges of OTL are further elaborated in Section 2.5.2.

In addition to anxiety about the need to rapidly adapt to OTL, the effects of COVID-19 impacted the mental health of many students who suffered from anxiety due to the uncertainty of the time and how the changes would impact their academic progress (Aucejo et al., 2020; Praghlapati, 2020).

## **2.5. Role of online teaching and learning in education systems**

According to Dumford & Miller (2018) and Mardiana (2020), the use of OTL has become a popular trend, especially in the 21<sup>st</sup> century, and is used to offer education in a more resourceful and convenient way. Although online teaching and learning had been somewhat of a popular option in the past., it has become a vital and primary alternative option during the worldwide COVID pandemic.

Although OTL is not a new construct for universities, not all universities were ready for the rapid transition to OTL precipitated by COVID-19. Ideally, the transition to OTL should not be a difficult one as many education systems make use of computer labs, students use laptops, and many resources are made available to students via online student portals (Mardiana, 2020). This, however, is not always the case, especially in South Africa where many students do not always have laptops, resources, or access to the internet to proceed with OTL.

OTL makes use of internet technology, which enables students and educators, at all education levels, to continue with their teaching and learning anywhere and at any time. This eliminates teaching and learning limitations such as distance, space, and

time (Verawardina et al., 2020). OTL can be approached through emails, learning and discussion platforms such as Moodle or TEAMS, and/or video platforms such as Skype or Zoom.

The success of OTL is primarily the responsibility of educators as they have to be flexible and adaptable with their teaching approaches, skills, attitudes, and online knowledge (Mardiana, 2020). Verawardina et al. (2020, p386) add that educators are required to *“facilitate as facilitators, collaborators, mentors, trainers, directors and study partners and can provide choices and great accountability to students to learn”*. Educators have to adapt their teaching methodology to facilitate a new way of learning for students (Mardiana, 2020). Although it seems like a daunting task, OTL does provide multiple benefits to both students and educators when executed appropriately.

### **2.5.1. Benefits of online teaching and learning**

There are numerous benefits associated with OTL, such as expanding the classroom environment (Dumford & Miller, 2018; Mardiana, 2020), developing new ways of independent learning, having flexible teaching and learning hours, improving active involvement from both students and educators, and gaining access to information and materials (Mardiana, 2020; Verawardina et al., 2020), and improved communication pathways for both students and educators (Mardiana, 2020).

Several positive features become available when schools and universities make a transition to OTL. Apart from having class online through means of discussion platforms, students and educators are able to access collaborative software and/or applications, and grades and assignments are easily accessed, completed, and uploaded (Verawardina et al., 2020).

OTL also provides students and educators with new perspectives (Verawardina et al., 2020) about present-day educational approaches. If implemented appropriately, OTL can reap multiple benefits for students and educators. However, in some respects, SA remains a third-world country with many students not having access to adequate technology and resources.



### **2.5.2. Challenges of online teaching and learning**

OTL has its challenges because many students might lack access to resources such as computers and internet facilities (Mathiba, 2020; Praghlapati, 2020; Verawardina et al., 2020). Additionally, educators also face challenges with inadequately functioning equipment, not being fully prepared, and having to rapidly adapt teaching and learning resources, assessments, and evaluations for online delivery (Dumford & Miller, 2018; Gonzalez et al., 2020; Mardiana, 2020). The rapid transition to OTL had various implications for both students and educators. One is that both students' and educators' mental health may have been affected during the time of crisis (Praghlapati, 2020).

When it comes to educators, they are faced with having to adapt their teaching approaches and methods to best suit OTL. This means that they have to evaluate and assess their students online, which is not an easy task (Gonzalez et al., 2020; Mathiba, 2020). According to Amory et al. (2008) assessments aid educators with their curriculum as they provide them with comparisons between their teaching approaches, goals, and outcomes. Assessments help the educators to examine the transfer of students' skills and knowledge from coursework to application. They also provide the necessary feedback that students require to support or improve their learning (Amory et al., 2008).

OTL can have consequences for students' academic performances, as it can make it harder for educators to determine whether or not students are equipped to progress within their program through online assessments. Gonzalez et al. (2020) investigated the effects that COVID-19 had on university level students' academic performance in Spain. Involving 458 students, they made use of online tests through e-valUAM and Moodle platforms.

Gonzalez et al. (2020) found that students showed better academic performance on their tests during COVID-19 quarantine. This was the case for courses that did not increase their assessments and workload as well as those which did increase their assessments and workload online. The researchers also found that COVID-19 quarantine changed students' learning strategies in terms of continuous study, which

was not the case before COVID-19 for many students. Gonzalez et al. (2020) concluded that new assessment processes also did not influence the academic performances of students, but that it was the new learning approaches and methods of students that had the more significant impact.

Gonzalez et al. (2020) showed that assessments are not necessarily the reason why students' academic performances decline when a transition to OTL takes place, inferring there may be other factors that lead to a decline in academic performance. In the context of a rapid transition to OTL, students are faced with uncertainty about their studies, especially in terms of their academic performance, learning plans, work-integrated learning experiences, and employment opportunities (Aucejo et al., 2020). For students, there are multiple other factors at play, including having access to online resources (Mathiba, 2020; Praghlapati, 2020; Verawardina et al., 2020), obtaining academic support, and accessing mental health support (Praghlapati, 2020).

Another factor that plays a role in the success of OTL is the students' background. Students at university have diverse backgrounds in terms of their school education (Schuch & Henriksen, 2013), demographics (Dumford & Miller, 2018), and domestic upbringing, all of which are factors that influence the success of online learning. When looking at third-world countries such as SA, many students come from disadvantaged backgrounds and do not always have access to adequate resources and appropriate spaces to work and learn. Not only are some students at a disadvantage, but the majority are faced with having to self-motivate, self-discipline, and self-organize to succeed in their online learning (Dumford & Miller, 2018). This all has an impact on students' academic performances.

Adapting to OTL approaches can become a problem for applied courses, which refers to the student's physical involvement in the course. With courses such as EE, the applied element of the curriculum is not executed effectively as both students and educators are not able to physically partake in these applied elements via online means. This becomes a challenge for those who rely on applied teaching and learning throughout their course.

According to Dumford & Miller (2018), understanding the OTL environment and how it affects students and educators is important as it can be used to develop the processes and implementation of online programs in the future.

### ***2.5.3. Influence of online teaching and learning approach on applied courses.***

The applied component of EE consists of students learning about the natural environment while being physically active in nature. This can become challenging when the situation requires that EE be taught online, especially when having to adapt the applied components of teaching and learning and applied assessments in response to a rapid transition to OTL. Jeong & So (2020) are amongst a few researchers who have considered the challenges associated with online physical education classes on schools and universities having to rapidly transition to OTL due to a worldwide pandemic. According to Jeong & So (2020), programs that depend on applied elements when teaching have to carefully consider how they will approach their curriculum for OTL as well as understand how OTL is executed and whether or not applied courses can be executed adequately online.

Jeong & So (2020) assessed the difficulties six middle and high school teachers experienced while transitioning physical education classes to OTL in Korea. The educators found it challenging to teach physical education classes online for the first time. The difficulties they encountered included the monotony of the classes, the trial-and-error teaching methods, and limited evaluation guidelines. Dumford & Miller (2018), Gonzalez et al. (2020), and Mathiba (2020) also found that the teaching approaches and evaluation methods were difficult for educators adapting to OTL. These challenges make it difficult to determine if the online content offered by educators is successfully achieving intended teaching goals and outcomes (Amory et al., 2008; Gonzalez et al., 2020). This is especially true for applied courses.

Although the challenges of teaching an applied course online are prominent, they can be overcome. Jeong & So (2020) recommended that strategic planning and learning methods are required to better communicate the value of physical education. In other words, applied courses should consider a different approach to OTL when it comes to

their curriculum. Secondly, it is important to encourage educators who teach applied courses to expand their online teaching knowledge through means of connecting, collaborating, and sharing resources with other educators, who teach applied courses. Lastly, the students themselves need to actively participate in OTL, especially in terms of applied components.

### **CHAPTER 3: NELSON MANDELA UNIVERSITY, GEORGE CAMPUS - A CASE STUDY**

This research took place at NMU George Campus. The George Campus was originally established as a forestry college, known as Saasveld, in 1932 (Nelson Mandela University (NMU) - School of Natural Resource Management (SNRM), 2005b). In 1986, Saasveld merged with Port Elizabeth Technicon, adding a new complement of natural resource management courses and degrees to the Technicon offerings over the next decade. These programs included Agricultural Management, Nature Conservation, and Wood Technology (NMU - SNRM, 2005b), all of which fall within the School of Natural Resource Management (SNRM). In 2005, the Port Elizabeth Technicon, University of Port Elizabeth, and a campus of the old Vista University merged into Nelson Mandela Metropolitan University, which the George Campus formed a part of. In 2017, the Nelson Mandela Metropolitan University rebranded and is now officially known as NMU.

NMU George Campus was selected as the study site for this research as it plays an important role in teaching students about the world that they live in. It develops students' abilities to think critically, initiate actions, solve problems, and set and achieve objectives. The university provides opportunities for students to build upon their attitudes, behaviour, knowledge, and beliefs about their surrounding environment. Students' understanding and knowledge about the environment can be changed through academia and the university provides an ideal setting to understand the relationship between the student's classroom environment and their attitudes and knowledge toward the natural environment.

Investigating students currently at the NMU George Campus provided an opportunity to understand the impact of the students' classroom environment on their attitudes and knowledge within different natural resource management programs and how they were changed. This research focused on the first-year SNRM students who registered for the three programs that were offered by the SNRM, namely the Agricultural Management Program (AMP), the Forestry Program (FP), and the Nature Conservation (NCP).

### **3.1. Agriculture Management program**

The AMP diploma consists of two years of theoretical teaching and one year of work-integrated learning, in the 2<sup>nd</sup> year 2<sup>nd</sup> semester until the 3<sup>rd</sup> Year 1<sup>st</sup> semester. The students in the AMP are exposed to a diverse range of agricultural systems and industries in the Western Cape (NMU - SNRM, 2005a). They are educated about the fundamentals of food and fibre production, processing, packaging, distribution, and exports, in terms of economic and environmental demands (NMU - SNRM, 2005a).

The AMP aims to provide students with technical, business, and entrepreneurial skills by teaching them about animal and plant biology, ecology, financial management, human resource management, marketing, law, and computer applications (NMU - SNRM, 2005a; NMU, 2013). Emphasis is placed on the entrepreneurial skills of an agricultural manager as it combines three resources to promote sustainable practices (NMU - SNRM, 2005a) - the natural environment, societal structure, and economic development.

The AMP ecological module considered for this research was Animal Production I because the learning outcomes and part of the core content focused on ecology and understanding animal environment interactions. An outline of the Animal Production I module can be seen in Table 3.1.

Table 3.1. Animal Production 1: Module learning outcomes and core syllabus content, Agricultural Management Program Diploma (NMU, 2018a).

Semester	Learning outcomes	Core Content of the module
1 <sup>st</sup>	1. Describe the livestock industry within the international, national, and local context.	Ecology Animal Production Industries Anatomy and Physiology of livestock species
	2. Understand the interaction between the animal and environment and evaluate the suitability of different breeds within species.	
	3. Understand the anatomical features, structures, functions, and physiological processes of the following systems of monogastric animals, ruminants, poultry, and ratites: digestive systems (nutrition), reproductive systems, skeletal and muscular systems (meat science), mammary glands, circulatory and respiratory systems, blood and other body fluids, and the integumentary system.	

NMU George Campus aims to equip its agriculture students with skills in entrepreneurship and leadership abilities to empower their communities. Students who decide to study Agriculture at NMU George Campus are equipped for job opportunities in farming, agricultural businesses, and parallel fields within the industry (NMU - SNRM, 2005a). These students can take up positions in: “*farming, farm management, agricultural consultancy and extension, food distribution, agriculture tourism, game farm management, agricultural finance, nursery, landscape and golf course management, research and biotechnology and self-employment*” (NMU - SNRM, 2005a).

### 3.2. Forestry program

Like the AMP, the FP diploma consists of two years of theoretical teaching and one year of work-integrated learning in the 2<sup>nd</sup> year. Students are educated about the essentials of sustainable forest management and the management of renewable resources (NMU - SNRM, 2005b; NMU, 2018d). The FP aims to provide students with knowledge of sustainability principles in silvicultural, forest management, forest engineering, cost and management accounting, economics, and environmental management (NMU, 2018d). Emphasis is placed on the protection of natural resources, creating a conventional site for the growth of pine trees, and harvesting

materials to provide products sustainably (NMU - SNRM, 2005b). The natural resource for this program is mainly pine plantations.

The FP was chosen for this research as the core syllabus content in the program included ecology. The ecology module that was considered within the FP was Forest Ecology I. An outline of the Forest Ecology I module can be seen in Table 3.2.

*Table 3.2. Forest Ecology 1: Module learning outcomes and core syllabus content, Forestry Program Diploma (NMU, 2018c).*

Semester	Learning outcomes	Core Content of the module
1 <sup>st</sup>	Explain basic ecological concepts	Components of an ecosystem. Limiting factors in the ecosystem.
	Identify and explain the factors involved in the distribution of plants and animals.	
	Identify and explain the characteristics of a plant community.	Energy of the ecosystem. Biochemical cycles in the ecosystem.
	Explain the different plant succession models.	

NMU George Campus aims to equip its forestry students with forest management and technical skills and knowledge. Students who decide to study Forestry at NMU George Campus are prepared for job opportunities in the forestry field (NMU - SNRM, 2005b). These students can take up positions in: “*forestry management, silvicultural management, forest engineering, nursery management, forestry contracting, conservation management, fire protection and management, forestry research, human resource management, computers in forestry, transport management, [and] agroforestry*” (NMU - SNRM, 2005b).

### **3.3. Nature Conservation program**

The NCP diploma consists of two years of theoretical teachings and one year of work-integrated learning in the 3<sup>rd</sup> year. Students in the NCP are taught about the sustainable management and utilization of renewable natural resources in a way that promotes the conservation of biodiversity (NMU - SNRM, 2009). The NCP aims to provide students with knowledge of animal and plant biology, ecology, and resource



management (NMU, 2018e). Emphasis is placed on the conservation of natural ecosystems and managing biodiversity (NMU - SNRM, 2009).

The NCP was chosen as a case study for this research as the core syllabus content in the program included ecology. The ecological module that was considered within the NCP, for this research, was Ecology I. The module's core content focuses on the basic concepts of ecology in terms of plant and animal communities. An outline of the Conservation Ecology 1 module can be seen in Table 3.3.

*Table 3.3. Conservation Ecology 1: Module learning outcomes and core syllabus content, Nature Conservation Program Diploma (NMU, 2018b).*

Semester	Learning outcomes	Core Content of the module
1 <sup>st</sup>	1. Discriminate among concepts orientated to the ecology of individuals (e.g., metabolic rate, energy flow, growth, etc.) to concepts orientated to population ecology (e.g., dispersal, what regulates population growth and demographic tables, R and K strategies, etc.) to concepts orientated to community ecology	Ecology of the individual, population, and community. Population dynamics and regulation. The environment; physical environment, habitat, and trophic levels. Energy transfer and nutrient cycling.
	2. Explain the importance of biodiversity	
	3. Relate factors of population regulation to real population dynamics.	
	4. Compare intraspecific and interspecific relationships of the biotic environment.	
	5. Explain how species co-exist or exclude each other by referring to concepts such as niche, resource partitioning, competitive exclusion, etc.	
	6. Relate the importance of the theory of trophic levels and pyramids (of numbers and biomass) to how ecosystems function.	
	7. Summarise the flow of energy in ecosystems.	
	8. Compare the different nutrient cycles as well as carbon cycles and explain the anthropogenic impacts on these (including pollution, greenhouse effect, and acid rain).	
	9. Compare different levels of nutrient cycling and how organisms respond to these by using examples.	
	10. Discriminate between different environments in terms of geology and soils, topography, light, and temperature, etc.	

NMU George Campus aims to equip its nature conservation students with skills in environmental education and technology. Students who decide to study Nature Conservation at NMU George Campus are equipped for job opportunities in nature conservation (NMU - SNRM, 2009). These students can take up positions in: *“nature conservation, wildlife management, extension services, national parks, provincial*

*nature conservation departments, national government and local municipalities, private nature reserves and properties, and forestry companies” (NMU - SNRM, 2009).*

### **3.4. Case study population**

The participants of this research came from unique backgrounds and formed a part of the SNRM. Table 3.4 shows a summary of the demographics of the three programs considered for this research from 2005 and 2020. The figures were estimated according to registration records which were obtained from the Director of the SNRM School at NMU George Campus. The number of students increased across all the programs offered by the SNRM from 2005 to 2020. As can be seen in Table 3.4, the registration of females and African students (which refers to the black students), in particular, increased significantly as the years progressed. The same cannot be said for the Coloured and Indian students.

*Table 3.4. Demographic information of the three SNRM programs for 2005 and 2020 (Dean of Natural Resource Science and Management, 2020).*

<b>Program</b>	<b>Gender and Race Demographic</b>	<b>2005</b>	<b>2020</b>
Agriculture	Gender - Male	68	93
	Gender - Female	11	66
	<b>Race Demographics</b>		
	Race - African	10	114
	Race - White	66	43
	Race - Coloured	3	1
	Race - Indian	0	0
	<b>Total registered</b>	<b>79</b>	<b>159</b>
Forestry	Gender - Male	91	124
	Gender - Female	37	98
	<b>Race Demographics</b>		
	Race - African	86	206
	Race - White	38	13
	Race - Coloured	4	2
	Race - Indian	0	1
	<b>Total registered</b>	<b>128</b>	<b>222</b>
Nature Conservation	Gender - Male	57	67
	Gender - Female	39	62
	<b>Race Demographics</b>		
	Race - African	13	65
	Race - White	80	54
	Race - Coloured	3	10
	Race - Indian	0	0
	<b>Total registered</b>	<b>96</b>	<b>129</b>

### **3.5. Nelson Mandela University's approach to online teaching and learning**

NMU was one of many universities across South Africa that adapted to the COVID-19 pandemic by transitioning to OTL. The university's approach was unique in so far as they decided to implement two pathways to support students in completing their semester one modules. The two pathways were intended to range from digital interactions to face-to-face interactions and combinations of the two (NMU, 2020). OTL started on 28 April 2020 with students enrolling in an online orientation module to prepare them for digital learning and the teaching of their modules.

Pathway 1 implemented digital learning, which was divided into three sub-categories. pathway 1A included digital learning, with face-to-face revision when possible. pathway 1B included theoretical aspects that would be completed digitally, but experiential learning would be completed face-to-face. Pathway 1C included

theoretical aspects that would be completed digitally but a few class contact sessions and some experiential learning would be completed face-to-face (NMU, 2020).

Pathway 2 was implemented for students who did not have access to pathway 1. Pathway 2 assumed that students had limited or no possibilities to learn online nor from their textbooks and notes at home. Pathway 2 relied on intensive learning and teaching and tutoring when students returned to face-to-face learning (NMU, 2020). Students would take some time before achieving their module outcomes and would require additional support from lecturers. NMU provided a summary and explanation of the two pathways that were offered to students, which can be seen in Figure 3.1 (NMU, 2020).

The two pathways created by NMU were established to enable students to complete the academic year of 2020. This was done by means of the Moodle platform, which is a free and open-source learning management system that allows educators to continue with their coursework online (Moodle, 2004). Efforts and inputs made by the NMU academic staff to accommodate students for OTL played a significant role in the success of the two pathways. Students were exposed to various teaching approaches as methods needed to be adapted. For this research, I looked into how the pandemic influenced the first-year SNRM students at the NMU George Campus.



Figure 3.1 OTL pathways implemented by Nelson Mandela University (NMU, 2020).

## CHAPTER 4: METHODS

This chapter explains the approach that was taken for this research and elaborates on the research objectives, questions, and the role I performed in this research. Subsequently, I elaborate on the paradigm that was adopted and the triangulation design that was employed to guide the research. Next, I clarify the sampling design, explaining the types of sampling methods that were used to obtain data from the participants. The demographics and sample sizes of the participants are also elaborated on with information given about the three ecological modules, the first-year SNRM students, and the three lecturers.

The two tools that were used in the research, namely questionnaires and semi-structured interviews, are described, along with details of the purpose of the tools, what information they collected, how and when they were distributed, and the number of participants that participated. Consideration of the trustworthiness of the research follows as I elaborate on the validity, reliability, credibility, transferability, dependability, and confirmability of the research.

Content analysis was used for each data set obtained from the research tools. Atlas.ti was used to categorize, summarize, and sort each data set (Atlas.ti 2021). This chapter ends with a brief overview of the ethical procedures for this research as they played a vital role in protecting the rights of the participants.

### 4.1. Research approach

This research aimed to understand the first-year SNRM students' baseline environmental attitudes and knowledge and how they changed through exposure to the ecology module. Additionally, this research aimed to understand how a rapid transition to OTL impacted both the first-year SNRM students and the three environmental lecturers. The following research questions were addressed in this research:

1. What were the environmental attitudes and knowledge of first-year SNRM students and how did they change during the course of an ecological module?

2. What were the first-year SNRM students and the three environmental lecturers' experiences with having to rapidly transition to online learning and teaching?

I took a constructivist position in this research. The constructivist position is a research paradigm associated with a set of beliefs and agreements shared among various researchers about how research problems are understood (Rahi, 2017). As a constructivist, I follow authors such as Given (2008), Gill (2015), and Rahi (2017), that knowledge is constructed through social interactions and individual experiences in the classroom environment. I sought to understand the interpretation of individuals in the world they find themselves in (in the manner described by Creswell (2003) and Creswell & Poth (2016)). In this case, it was the interpretation of the first-year SNRM students and the three environmental lecturers in the physical and virtual classroom.

Through the constructivist lens, the classroom environment (both physical and virtual) is constructed by the students, the lecturers, and myself (as the researcher). The ontology adopted in this research recognized that multiple realities were socially constructed. From an epistemological point of view, knowledge is constructed (Given, 2008; Noddings, 2018) by myself, the first-year SNRM students, and the three environmental lecturers through the research process. Insights and understanding of concepts emerge through the joint construction of knowledge (Given, 2008). By understanding the change in first-year SNRM students' environmental attitudes and knowledge over the first semester, I intended to uncover the first-year SNRM students' subjective meanings about their environmental attitudes and knowledge, and their classroom environment.

A constructivist paradigm has the potential to provide an analytical framework for multiple, co-existing knowledge structures, for example in a comparison of different disciplinary knowledges. In this study, however, my primary concern is with the baseline knowledge set about natural resources that students have as they enter the university. Therefore, this is signified using the singular form "knowledge". Furthermore, any additional student insights identified in the study are conceptualized as an expansion of the same knowledge set and also referred to in the singular.

The three environmental lecturers' perception of the classroom environment was also considered to be a subjective experience constructed by their own paradigms and the experiences of the first-year SNRM students. The environmental lecturers' established classroom environment was believed to be experienced differently by each student that partook in their ecology module. I considered the complexity of the interpretations that were made by the first-year SNRM students and three environmental lecturers in the classroom environment, as well as the interactions between and among each other.

The research considered a change in environmental attitudes and knowledge in first-year SNRM students and sought to understand how the classroom environment influenced those changes. The following assumptions were made by myself for this research, as reinforced by Creswell (2003), Given (2008), Gill (2015), and Rahi, (2017):

- The perceptions that students had of the classroom environment were shaped as they engaged with the content of the ecological module.
- First-year SNRM students had subjective meanings of the classroom environment, which were established from interactions with other students and/or the environmental lecturers.
- Students engaged with the world and made sense of it based on their individual integrated perspectives.
- Lecturers were likely to use different combinations of traditional instructivist teaching methods and applied methods more in line with a constructivist paradigm. Teaching approaches of the lectures were assumed to be linked to change in environmental attitudes and knowledge in first-year SNRM students.

#### **4.2. Role of the researcher**

By adopting a constructivist approach, I acknowledge that I had my own understanding of the world. The meaning that I had established about concepts was subjective and this influenced how I interpreted other peoples' worldviews as guided by Creswell (2003) and Creswell & Poth (2016).



As a researcher, I moved from a largely passive role of distributing questionnaires with the students to a more interactive role when conducting the semi-structured interviews with the environmental lecturers.

I coded and analyzed the data from the questionnaires and semi-structured interviews to discover patterns of changed environmental attitudes and knowledge within the first-year SNRM students. I acknowledge that the data obtained from the first-year SNRM students and the three environmental lecturers were open to my own subjective interpretation of a specific context and for this reason, my findings will never be 100% repeatable (Cohen et al., 2013; Lincoln et al., 2005).

### **4.3. Triangulating the data**

Triangulation refers to the use of various data sources and/or different data analysis approaches to strengthen the credibility of the research, as well as, incorporate multiple perspectives to better understand the research questions (Hastings & Salkind, 2012).

It was planned that the research would adopt a triangulation design using a multilevel model. The triangulation model was intended to make use of three different research tools to address the research question. The use of a multilevel triangulation model was ideal for this research as it would have collected data on different attributes (Newing, 2010), analyzed data sets separately, and provided an integrated interpretation of all the data together to answer the research problem (Creswell & Plano, 2006).

The three research tools that were intended to be used for the multilevel triangulation model were questionnaires, semi-structured interviews, and focus group sessions. Unfortunately, due to the enforced rapid transition to OTL, the focus group sessions were not able to proceed due to the lack of availability of participants and the limitations imposed on face-to-face engagements during the pandemic. The multilevel triangulation model had to be abandoned and instead, a concurrent triangulation design was followed for data collection and analysis.

The concurrent triangulation design followed a one-phase approach. This approach used both quantitative and qualitative methods. Quantitative and qualitative data were

collected separately. These data sets were analyzed separately but interpreted together in the discussion of the findings (Creswell & Plano, 2006). Using the concurrent triangulation design allowed me to best understand my research problem and answer my research questions. I used this triangulation approach to compare my two collection methods and verify my results. This enabled me to deepen my understanding of the environmental attitudes and knowledge of first-year SNRM students with the added insights of the three environmental lecturers.

The data sets were collected at different time periods. Thus, baseline questionnaires and semi-structured interviews were done in the first semester before the pandemic. The post-intervention questionnaires and follow-up semi-structured interviews were done during the second semester after the rapid transition to OTL had taken place. An equal weighting was given to the data collected from the questionnaires and interviews.

The use of both quantitative and qualitative methods, as included in the triangular design adopted for this research, aids in the understanding of multiple realities (Hastings & Salkind, 2012; Lincoln et al., 2005; Sandelowski, 2000). The approach served as a method of comparison for various meanings (Cohen et al., 2013; Hastings & Salkind, 2012) constructed by the first-year SNRM students and the three environmental lecturers, through identifying the different experiences of the two groups of participants.

For this research, using an adapted form of triangulation also helped me to reduce the bias when the data was analyzed by cross-examining and comparing the different data sets separately and then together. Figure 4.1 provides an outline of the concurrent triangular design adapted and modified from Creswell & Plano (2006) that guided the data collection, analysis, and interpretation.

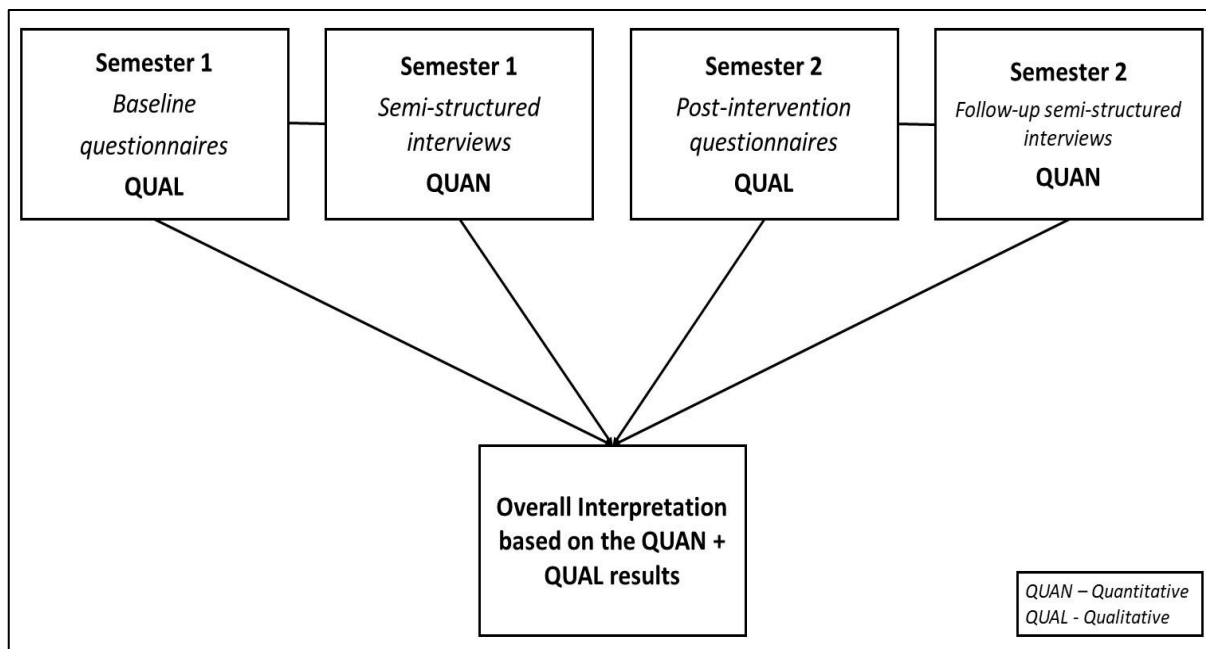


Figure 4.1 Concurrent Triangular Design adapted from Creswell & Plano (2006).

#### 4.4. Sampling design

The participants consisted of first-year SNRM students in the AMP, FP, and NCP and the three environmental lecturers who taught the ecological modules in these programs. The classroom environment played a significant role in understanding the change in environmental attitudes and knowledge of students. Thus, it was the targeted sample range. There were two data collection periods: the first started at the beginning of February 2020 and the second during October 2020. Each data collection period made use of different sampling strategies, namely stratified random sampling and purposive sampling.

##### 4.4.1. Stratified random sampling

Stratified random sampling identified participants based on equal probability and was used to randomly choose first-year students within the three SNRM programs, creating three subgroups. Stratified random sampling divides the overall population into subgroups (Cohen et al., 2013; Given, 2008; Onwuegbuzie & Collins, 2007; Rahi, 2017) which consist of participants who share similar characteristics (Cohen et al., 2013; Onwuegbuzie & Collins, 2007). For this research, similar characteristics

included being first-year SNRM students enrolled in one of three programs (AMP, FP, and NCP) and being registered for the ecological module within the program.

Stratified random sampling presents an equally balanced representation of each subgroup, with the selection of participants being based on equal probability (Rahi, 2017). Stratified random sampling was therefore an ideal approach to use for this particular problem as there was an equal chance for first-year SNRM students in each of the programs to be selected with this sampling approach, thereby ensuring that each of the three programs was represented objectively.

With regards to the number of students who participated in this research, it would have been ideal to collect data from the whole class. However, this was considered to be unattainable because participation in the research was of a voluntary nature.

#### ***4.4.2. Purposive sampling***

Purposive sampling selectively picks participants to partake in research, selecting participants relevant to the specific data collection aims (Newing, 2010; Rahi, 2017). In this case, participants were the three environmental lecturers teaching the three ecological modules. The criteria that were used for the selection of the environmental lecturers were that they had to be teaching the first-year ecology module for either the AMP, FP, or NCP. Purposive sampling provided access to these specific individuals who were the holders of the knowledge that I was looking for.

The first-year SNRM students were also purposefully selected in terms of the AMP, FP, and NCP. The criteria that were used for students when purposively selecting them for the research were that they had to be first-year SNRM students, they had to be enrolled in either the AMP, FP, and NCP, had to be over the age of 18, and had not to be a senior student repeating the ecology module.

The sampling of the representative groups of first-year SNRM students and the three environmental lecturers prevented me from generalizing about the overall SNRM student population, However, it did represent the specific groups from which data was collected.

#### **4.4.3. Limitations of sampling strategies adopted**

No sampling strategy is perfect, and each method has its advantages and disadvantages. The challenges associated with the sampling strategy employed in this research included participants being overlooked because the first-year SNRM students on the selected programs were unknown to me in the first semester; baseline data being affected by students who had already repeated the module; and post-intervention data being affected due to the limitation of online participation.

The challenge related to overlooking students was counteracted in this research by obtaining a full list of registered students beforehand. This prevented students from being overlooked as well as helped me to identify students who were in their second year, thus identifying if they were repeating the module. Participating students were also asked if they were repeating the identified module. If this statement was true for a student, the data provided by the student was not included in the data analysis. The challenge of the post-intervention data being affected due to the limitation of online participation was mitigated by keeping constant communication with the first-year SNRM students through emails, providing a two-week period to complete the questionnaire, and making several appeals for participation.

Although efforts were made to mitigate the withdrawal of students from the research as the university transitioned to OTL, the effects of COVID-19 took a toll on participant numbers. Some of the first-year SNRM students did not have access to online resources to be able to participate in the online post-intervention questionnaire and, coupled with the additional stresses of transitioning to OTL, fewer students participated in the post-intervention data gathering phase. This meant that not all the students who participated in the baseline questionnaire participated in the post-intervention questionnaire, which ultimately affected the comparative nature of the research. Although this was not ideal, and despite the lack of full involvement of the first-year SNRM students in the post-intervention questionnaire, there were still enough respondents to provide valid data. These results were used to compare the before and after picture for this research.

#### **4.5. Description of sample size**

The sample of participants selected in this research came from three programs offered by the SNRM at NMU George Campus, namely AMP, FP, and NCP. These three programs did not represent the whole SNRM population, for example, it excluded the 2<sup>nd</sup> year cohort and students from the Wood Technology Program within the SNRM. It did, however, represent a sample of the population from the three programs selected. The core focus of the research was on the first-year SNRM students within the three programs, with the ecological modules of each program being the narrowed point of attention.

The program modules that were chosen for the research focused on teaching students about ecological principles and included Animal Production 1, Forest Ecology 1, and Nature Conservation Ecology 1. Ecology refers to a subdivision in science and focuses on the interrelationship of organisms and their environment (Merriman Webster, 2018). The first-year SNRM students selected for this research were enrolled in one of these modules. The ecological modules provided me with the opportunity to keep the research within a common area of focus and to see how the ecology classroom environment in the three different programs could potentially contribute to a change in students' environmental attitudes and knowledge.

Table 4.1 provides information on the sample sizes of the first-year SNRM students and three environmental lecturers who participated in the research within the different programs, along with the type of method and sampling approach.

*Table 4.1. The sample size of first-year SNRM students and three environmental lecturers who participated in the research within the different programs.*

<b>Program</b>	<b>Method</b>	<b>Sampling</b>	<b>Sample size</b>
<b>Student population size for baseline questionnaire</b>			
Agriculture	Baseline questionnaire	Stratified random	37 students
Forestry			48 students
Nature Conservation			22 students
<b>Total</b>			<b>107 students</b>
<b>Student population size for post-intervention questionnaire</b>			
Agriculture	Post-intervention questionnaire	Purposive	10 students
Forestry			12 students
Nature Conservation			11 students
<b>Total</b>			<b>33 students</b>
<b>Lecturer population size</b>			
Agriculture	Semi-structured interviews	Purposive	1 lecturer
Forestry			1 lecturer
Nature Conservation			1 lecturer
<b>Total</b>			<b>3 lecturers</b>

The total number of students who participated in the baseline questionnaire across all three programs was 107. The breakdown for each program was: 37 participants from the AMP; 48 participants from the FP; and 22 participants from the NCP. The total number of students that participated in the post-intervention questionnaire across all three programs was 33. The breakdown for each program was: 10 participants from the AMP; 12 participants from the FP; and 11 participants from the NCP. The lecturer's population size remained the same for the first semi-structured interviews and the follow-up semi-structured interviews, which were three in total.

#### **4.6. Data gathering methods**

Multiple methods were used to gather data on the first-year SNRM students' environmental attitudes and knowledge as well as on the three environmental lecturers' teaching methods and approaches. Questionnaires were used to survey the first-year SNRM student baseline and post-intervention environmental attitudes and knowledge towards the program they were enrolled in, the natural environment, and the rapid transition to OTL. Semi-structured interviews were used to gather data on the three environmental lecturers' views, opinions, teaching approaches, and their rapid transition to online teaching in terms of their ecological modules.

#### **4.6.1. Questionnaires**

Questionnaires were used for this research as they provided structured questions that generated both quantitative and qualitative data. Questionnaires are able to gather large data sets within a short period (Newing, 2010). Baseline and post-intervention questionnaires were used to collect data on students' environmental attitudes and knowledge within each respective ecological module. The questionnaires allow the collection of perception-based data (Phellas et al., 2011; Rahi, 2017) which I was able to use to assess a change in the collective students' attitudes and knowledge about the natural environment within the ecological module over the duration of a semester.

The baseline questionnaire (Appendix 1) was used to generate baseline data on the first-year SNRM students' environmental attitudes and knowledge at the start of the first semester. The post-intervention questionnaire (Appendix 2) was used to assess change in the attitudes and knowledge of the students and to identify what factors in the classroom environment might have played a role in changing their environmental attitudes and knowledge. It also sought to understand the influence of the rapid transition to OTL on first-year SNRM students' studies.

The types of questions that were asked in the baseline and post-intervention questionnaires were both closed-ended and open-ended. The closed-ended questions gathered demographic information. The post-intervention questionnaire also made use of a Likert scale where students were asked to rate possible factors that might have influenced their perspectives on the environment. The scale ranged from very low (1) to very high (5). Open-ended questions can be used to generate qualitative data from which themes and patterns are observed (Turner, 2010). The open-ended questions in my questionnaire asked the students what, why, and how they felt about their registered program, the ecological module, and the natural environment.

The questionnaires were distributed at two different periods, namely before and after a module intervention. The intervention consisted of an ecological module introduced within the first semester into each of the three SNRM programs. The baseline questionnaire was used to collect data before the students had been exposed to the ecology module during the first semester. The post-intervention questionnaire was



used to collect data after the students had been exposed to the ecology module after the first semester. I aimed to understand the contribution that the classroom environment, both physical and virtual, had made towards changes in the first-year SNRM students' environmental attitudes and knowledge.

The research was introduced to the students during the NMU George Campus and SNRM orientation on the 25<sup>th</sup> of January 2020. The timelines for distributing the questionnaires can be found in Appendix 3. The baseline questionnaire sessions started with an introduction to the research through verbal and written information (Appendix 4 and Appendix 5). I was available to assist the students when they answered the questionnaires to clarify any unclear questions. The completion time for the questionnaire sessions ranged from 10 minutes to 25 minutes.

Due to COVID-19, the post-intervention questionnaire was implemented online rather than face-to-face. The second data collection phase began on the 1<sup>st</sup> of September 2020. The online questionnaires were distributed to students through the Moodle platform and via email. The Agriculture and Nature Conservation students were updated on the research via the ecological module's Moodle class. These students participated in the online questionnaire through links provided in the Moodle class. The Forestry students were updated on the research via email and were provided with links to participate in the online questionnaire. The difference in the delivery of the post-intervention questionnaire between the Agriculture/Nature Conservation students and the Forestry students did not have any distinct effect on the rate of participation, as participation numbers remained similar across the three (between 10 to 12 students). Completion of the post-intervention questionnaire ranged from 10 minutes to 25 minutes.

#### ***4.6.2. Semi-structured interviews***

Semi-structured interviews were used to collect data from three environmental lecturers in respect of their teaching methods and approach to the ecological modules. Semi-structured interviews were used for this research because they offered flexibility during the interview process as they did not strictly follow a formalized set of questions.

Such interviews allow researchers to explore the outlooks of specific participants (Newing, 2010).

The semi-structured interviews (Appendix 6) were initiated during the first semester and collected in-depth data from the environmental lecturers within each first-year SNRM ecological module in the three programs. Open-ended questions, which were used as a guide for the interviews, allowed for the interview to be flexible in its approach (Hatton MacDonald et al., 2013; Newing, 2010; Turner, 2010). Using this approach also allowed me to ask probing questions to clarify what was said and to encourage elaboration.

The environmental lecturers were asked to reflect on, describe, and explain their teaching methods and approach to the ecological modules that they were involved with, and to provide information about their views and opinions of the first-year SNRM students in respect of their environmental attitudes and knowledge. The environmental lecturers were asked to answer each question openly and honestly. If any questions were unclear, I clarified or explained the question being asked. I aimed to understand the environmental lecturers' views, opinions, and teaching methods, and approaches to teaching the ecological modules and how this could have influenced the change in students' environmental attitudes and knowledge.

The interviews with the three environmental lecturers occurred during the first academic week of 2020. The environmental lecturers that took part in the interviews were identified and contacted at the beginning of January 2020. The three lecturers agreed to be interviewed at certain scheduled times (Appendix 3). Each interview session began with a brief overview of the research aims and objectives. The interviews took place within each lecturer's respective office and took about half an hour to complete.

Follow-up interviews (Appendix 7) were scheduled (Appendix 3) with the environmental lecturers to shed light on a few themes that had been discovered during the first set of interviews, as well as to gain insights into how the rapid transition to OTL had affected the teaching and learning environment. Three questions around the rapid transition to OTL were asked. The follow-up interview sessions were completed

over a scheduled recorded TEAMS meeting and ranged from half an hour to an hour to complete. Each interview session began with an explanation for the follow-up interview and a brief description of how the research had to be adapted, taking the effect of COVID-19 into account.

#### **4.7. Data analysis**

Multiple data analysis methods were used to analyze the data obtained from the first-year SNRM students and the three environmental lecturers. The collected data sets were transcribed and sorted according to the research objectives. Afterward, a content analysis was performed whereby codes were defined and derived during the analysis process (as elaborated by Hsieh & Shannon (2005)).

The quantitative data was categorized separately within an Excel spreadsheet, allowing for descriptive statistical analysis to be conducted. Themes and subthemes were identified from the data and linked to the research objectives. Descriptive statistical analysis was used to analyze the quantitative data obtained from the questionnaires and the semi-structured interviews, in the form of tables and graphs.

The baseline questionnaire set out to answer objective one, which was to establish an understanding of the baseline environmental attitudes and knowledge of first-year SNRM students who were undertaking three SNRM ecological modules. The post-intervention questionnaire set out to answer objective two, which was to assess the changes in first-year SNRM students' environmental attitudes and knowledge after an education intervention, namely the ecological modules.

The first interviews set out to answer objective three and objective four, which were to understand what type of teaching approaches were used by three environmental lecturers teaching the ecological modules and to evaluate how the teaching approaches of the three environmental lecturers influenced the baseline environmental attitudes and knowledge of the first-year SNRM students.

Both the post-intervention questionnaire and the follow-up interviews set out to answer objective five, which was to understand the experiences of first-year SNRM students

and the three environmental lecturers who had to rapidly transition to online teaching and learning.

#### **4.7.1. Content analysis**

Content analysis, which is the summarization and categorization of data, was used to analyze the qualitative data obtained from the questionnaires and the semi-structured interviews. Content analysis can be used to systematically describe research findings in a written format (Biggs et al., 2008; Elo & Kyngäs, 2008; Given, 2008; Hsieh & Shannon, 2005). Content analysis is a phenomenon based on inductive coding of the collected data (Hsieh & Shannon, 2005).

Through using content analysis, I was able to explore the first-year SNRM students' environmental attitudes and knowledge and the three environmental lecturers' teaching approaches, as well as their experiences with the rapid transition to OTL, by grouping words and phrases into categories. Categorization in this manner can be used to obtain meaning from the data to understand the context behind it (Elo & Kyngäs, 2008; Given, 2008). Atlas.ti was used to perform a content analysis of the primary qualitative data, by providing a means to sort, code, categorize, and manage the data.

When it came to the baseline questionnaire analysis, participants were divided into three different programs and each had their own unique code names and numbers to protect their identity (e.g., BNS 1). These code names were Baseline Agriculture student (BAS), Baseline Forestry student (BFS), and Baseline Nature Conservation student (BNS). Inductively determined themes guided the analysis and allowed for codes to emerge.

For the post-intervention questionnaire analysis, the same process used to analyze the baseline questionnaires were followed, again providing participants with their own unique code names, namely Post-Agriculture student (PAS), Post-Forestry student (PFS), and Post-Nature Conservation student (PNS). Emergent themes and baseline codes (Appendix 8) guided the post-intervention analysis and allowed for further codes to emerge. The coding process and my thoughts on the coding process were documented in Atlas.ti and paper memos, which can be seen in Appendix 3.

With regards to the semi-structured interview sessions, I transcribed the recordings into a word document and uploaded each word document as a primary document for analysis in Atlas.ti. Emergent themes guided the analysis and allowed for codes (Appendix 9) to emerge. The environmental lecturers were grouped according to the three programs and ecological modules that they were teaching. Each lecturer had their own unique code to protect their identity, namely Lecturer One (L1), Lecturer Two (L2), and Lecturer Three (L3).

#### **4.8. Trustworthiness of the research**

As this research made use of both quantitative and qualitative methods a few variables had to be addressed when it came to addressing the trustworthiness of the research. Trustworthiness assesses the confidence that the researcher is able to place on the findings of their research (Anney, 2014; Hsieh & Shannon, 2005). When it came to the quantitative nature of my research, the trustworthiness of the research was measured in terms of validity, reliability, and confirmability.

Focus on confirmability, rather than objectivity, to establish the value of trustworthiness throughout the research is best aligned with a constructivist approach (Creswell & Poth, 2016). In contrast, qualitative research measures the trustworthiness of the research in terms of credibility, transferability, dependability, and confirmability (Anney, 2014). The following sections elaborate on how I incorporated these variables of trustworthiness into my research.

##### ***4.8.1. Validity and reliability of data gathering tools***

Validity refers to the degree to which the selected research tools measured what they were intended to measure (Bui, 2013; Given, 2008). The research tools were piloted by me during 2019 after which the data was analyzed. The research tools were then adapted. Each measure was tested to ensure that the research tools collected the necessary data. The research tools were piloted with a sample population that consisted of senior students within the four SNRM programs, which included the Game Ranch Management program, to ensure that they measured all the aspects it was intended that they should measure.

Reliability refers to the degree to which research tools consistently measure what they were intended to measure (Bui, 2013; Given, 2008). To check for reliability, the research tools were piloted with the senior SNRM students at multiple times during the academic year of 2019, as the research design had undergone various changes throughout the year. It was determined that the research was best suited for a first-year SNRM population group, thus the research tools were modified to conform to a sample population of first-year SNRM students.

#### ***4.8.2. Credibility of the research.***

Credibility refers to the degree to which results of a research exercise are to be deemed accurate and consistent (Hsieh & Shannon, 2005), which ultimately relates to the validity and reliability of the research. The credibility of this research was established in multiple ways to ensure the consistency and accuracy of my results. My research made use of several approaches, as provided for by Cohen et al. (2013).

Through early engagement with the lecturers and prolonged engagement with the students, I became familiar with the qualities of my participants. I engaged with the environmental lecturers the year before (2019) while preparing for my research and continued engagement with them as I contacted the first-year SNRM students. I also engaged with the students early in January 2020, during their orientation period. My communication with them continued throughout the data collection periods. Both lecturers and students were regularly updated about my research when the NMU George Campus transitioned to OTL. This allowed me to establish a close relationship with all my participants which became vital during the rapid transition to OTL.

In addition to the use of a pilot study to establish the validity and reliability of my research early in the research design process, I also made use of a concurrent triangulation design, which served to further strengthen the validity of the research (Cohen et al., 2013; Given, 2008). Throughout my research process, I was exposed to peer debriefings in the form of proposal developments, research colleague presentations, ethical clearance procedures, supervisor reviews, as well as supervisor and research colleague feedback. These debriefings aided me to constantly work towards improving the trustworthiness of my research.

#### **4.8.3. Transferability of the research**

Transferability refers to the replicability of research (Anney, 2014; Given, 2008). The transferability of my research was achieved by providing adequate details about my research process. I did this by providing in-depth information on my research methodology, study context, and participants. Providing these in-depth descriptions of my research will aid other researchers to undertake similar studies in the future.

#### **4.8.4. Dependability and confirmability of the research**

Dependability refers to the strength of results over time (Anney, 2014; Given, 2008) which ultimately relates to the reliability of the research (Cohen et al., 2013). Confirmability refers to the results being a true reflection of the data and that the absence of inconsistencies when interpreting the data (Anney, 2014; Given, 2008). Achieving dependability and confirmability of my research are grouped as it made use of similar approaches.

The dependability of my research was established early on when I tested my research tools for reliability. Both dependability and confirmability were strengthened by accurately and constantly providing a true reflection of my data in my results and discussion chapter. This was achieved with the use of an audit trail (Appendix 3). Audit trails best address confirmability (Cohen et al., 2013). In this manner, I ensured that I kept track of my data collection and analysis process from the beginning to the end of my research.

My audit trail consists of a timeline of events before and during the data collection and analysis periods. With the use of *Atlast.ti*, I was also able to create memos whereby I noted down my thought process with regards to coding and analyzing my data. Paper memos were also used before COVID-19, which tracked my thought process as I collected and analyzed my data. My audit trail records can be found in Appendix 3.

I also described my role as the researcher (Chapter 4, Section 4.2), which acknowledged my understandings and biases that could have influenced my research. Additionally, I finished off my thesis with a personal reflection at the end of my research

(Chapter 9) whereby I explained my research journey to provide transparency of the research process.

#### **4.9. Limitations of the research design**

The limitations of this research are broken down into two parts, the first being the research design and the second being factors that affected the research that was beyond my control. The research design limitations were found in the triangulation of the data and the research tools. The limitations that I was not able to control consisted of the voluntary nature of research participation and the impact of the COVID-19 pandemic. The limitations of the research could not be avoided but were accounted for.

##### ***4.9.1. Limitations of triangulation***

Triangulation can be seen as a challenge for researchers as it can be costly and timely to implement multiple measures to understand the research problem (Hastings & Salkind, 2012). Making use of a triangulation design was beneficial for this research as it allowed me to obtain different types of data which was used to compare my results. However, the requirements of triangulation do not always make it a quick and easy process. It requires you to make use of multiple research tools and analysis procedures, which take some time to design. Both my questionnaires and interview questions had to be designed separately, yet in conjunction, with one another. They had to undergo multiple drafts and analytical tests to ensure that they would be able to stand alone as well as come together in triangulation. It took time to make sure that my research tools were up to standard. Only once the tools were fit for purpose was I able to continue with the research in accordance with ethical procedures.

##### ***4.9.2. Limitations of the research tools***

Using questionnaires and interviews both come with their collective limitations, such as the participants not being truthful with their answers or not fully understanding the question. When answering the questionnaires, participants could skip questions or not provide in-depth information. Unfortunately, this could not be avoided. The best that I was able to do when conducting the research was to encourage the first-year SNRM



students to answer all the questions in the questionnaires truthfully and in as detailed a manner as possible.

Bearing in mind that NMU teaches its students in English, the decision was made to distribute the questionnaires in English. Language may have been a disadvantage for some students, but I took great care to ensure that I used the most accessible language to reduce the disadvantage for some students. I also chose my wording carefully as I developed my questionnaires to try and eliminate as much misunderstanding as possible. The questionnaires also did not explore the first-year SNRM students' demographics and background, which is frequently done within the South African context. Including these themes would make an interesting study to further the findings of this research.

When I was able to distribute the baseline questionnaires face-to-face, I was able to aid students who did not understand the questions which limited questions being left out by the students. This was not achievable for the post-intervention questionnaire due to it being online.

Limitations with the semi-structured interviews included time constraints, including the availability of the participants. I combatted this by scheduling the interview sessions in advance with the three environmental lecturers.

Bias can be introduced by the researcher when conducting interviews (Phellas et al., 2011). Admittedly, bias was not something that could be easily identified. As a constructivist, I acknowledge that whilst conducting this research I had my subjective meanings and biases, which could have impacted the interviews. Consequently, it would have had an impact on the data analysis as well.

The questions asked within the questionnaires and interviews also had their own limitations. Closed-ended questions provided "Yes" or "No" answers (Given, 2008). This prevented me from obtaining detailed responses that provide in-depth information or a different perspective. Closed-ended questions within my research tools could not be avoided as they provided me with demographic information about my participants. It also provided me with descriptive data when participants were asked to rate certain factors. However, my research tools included a combination of open-ended and

closed-ended questions which allowed the participants to provide me with both demographic information and in-depth information and/or different perspectives.

### **4.9.3. Influence of COVID-19**

On 27 January 2020, the first data collection period started with the baseline questionnaire and semi-structured interviews. The post-intervention questionnaire was scheduled to be completed later in the first semester. However, due to the nationwide lockdown, data collection could not proceed as initially intended. The influence of COVID-19 played a big role in the research. COVID-19 introduced additional limitations in the research.

The face-to-face element of the research fell away for the post-intervention questionnaires, as students transitioned to OTL. The research design had to be revised and the initial research tools had to be amended for an online approach. However, this did not change the original aims and objectives of the research. It simply added another dimension to the rapid transition to OTL, which could not be ignored, and therefore further objectives and related questions and were added. The time it took to make amendments and implement the research for an online format was another increased limitation in this research. This caused a few delays to the research, which unfortunately could not be avoided. I acknowledged these limitations and continued with the research as best as I could under the challenging circumstances the pandemic presented.

Methodological limitations were exacerbated as the sample group of first-year SNRM students was affected by the accessibility of online resources for individual students and the additional stresses and strains brought about by the rapid transition to OTL. The voluntary nature of the research made it difficult to secure participation from the first-year SNRM students and the lecturers, and further lowered the involvement rate in the post-intervention phase of this research.

### **4.10. Ethical considerations**

Being a qualitative research project engaging with first-year SNRM students and environmental lecturers meant there were ethical considerations related to this study.

University students are considered to be a vulnerable population that requires protection. An ethics application was made to the NMU Human Ethics Committee - Human (REC-H) and ethics approval was granted on 14 December 2019 with reference number H19-SCI-NRM-007 (Appendix 10).

Following the onset of the COVID pandemic in South Africa, amendments were required for the post-intervention and follow-up semi-structured interviews to answer questions about the rapid transition to OTL. These tools had to be transitioned to an online approach as I was not able to use them face-to-face anymore. Additional approaches through the Moodle platform, email, and TEAMS platform were required to distribute the research tools. Thus, an amendment request was sent to the REC-H. Approval of the amendments was received on 25 June 2020 (Appendix 11) and the research was able to continue.

Three basic ethical principles were adhered to for this research, namely respect, beneficence, and justice for the participants (as outlined in United States, 1978). These principles guided and helped me to ensure that the participants' rights had been considered in this research. The rights of a participant for this research included being fully informed about the research, understanding that they had a choice to participate in the research, and knowing that the data they provided would be handled confidentially and that they would remain anonymous.

#### **4.10.1.      *Respect***

Respect for research participants meant treating them as autonomous individuals. It also requires researchers to respect the privacy and anonymity of the participants (United States, 1978). In practical terms, this meant respecting their decision to participate or not to participate in the research. Those who chose to participate were asked to provide their informed consent represented by an informed consent form found in Appendix 12.

I respected and protected the participants by ensuring that the first-year SNRM students and environmental lecturers had been approached with sensitivity, empathy, and in a responsible way. I worked closely with the respective authorities, such as the director of the SNRM, to ensure that the research protected the anonymity, of the first-

year SNRM students and environmental lecturers. Students' academic progress was not affected in any way by participating in the research and all their information was handled confidentially.

In terms of the environmental lecturers, they were reassured that their input would remain anonymous and that their academic standing or activities would not be affected in any way by participating in the research. I respected the expression of values, viewpoints, and opinions of all participants. I acknowledged the different paradigms of the environmental lecturers and respected any differences between my participants and my own outlooks and perspectives.

#### **4.10.2.      *Beneficence***

Beneficence refers to preventing harm to the participants by maximizing probable benefits and minimizing probable harm. In terms of this research, efforts were made to ensure that the benefits of the research were maximized for future students within the SNRM. No immediate benefits would be obtained for the participants of this research. Additionally, any form of mistreatment and harm to the participants were avoided. I remained open and honest and stated the findings of the research clearly and comprehensively to all who would have access to the thesis.

#### **4.10.3.      *Justice***

The justice principle refers to a uniform approach to all the participants and ensures that any benefits derived from the research will be distributed evenly among the participants. (United States, 1978). All the participants were always treated as equal contributors to the research with their personal information remaining confidential. The first-year SNRM students and environmental lecturers in each of the three programs, namely AMP, FP, and NCP, were all invited to participate in the research. Therefore, all students and lecturers were given an equal opportunity to participate and be a part of the research.

The rights of the participants and the three principles promoted by United States (1978) provided an ethical framework to follow in this research. Adhering to this

guideline ensured that participants were treated fairly and that no harm was done while undertaking this research.

## **CHAPTER 5: FIRST-YEAR SNRM BASELINE ENVIRONMENTAL ATTITUDES AND KNOWLEDGE AND HOW IT CHANGED**

The results for the data obtained from the baseline and post-intervention questionnaires conducted with the first-year SNRM students in the three programs are presented in this chapter. The baseline questionnaire was designed to provide data for objective one which was: to establish an understanding of the baseline environmental attitudes and knowledge of first-year SNRM students who were undertaking three SNRM ecological modules. The post-intervention questionnaire was designed to obtain data for objective two which was: to assess the changes in first-year SNRM students' environmental attitudes and knowledge after an education intervention, namely an ecological module. The post-intervention questionnaire also collected data for objective five which was: to understand the experiences of first-year SNRM students and the three environmental lecturers who had to rapidly transition to OTL. Objectives three and four are discussed in Chapter 6.

### **5.1. First-year SNRM students' views and opinions about the natural environment**

In the baseline questionnaire, the first-year SNRM students were asked to explain their views and opinions about their program. The responses to this question were given in terms of the first-year SNRM students' attitudes towards the natural environment. Five students directly stated that nature was important to them, whereas thirty-nine students explained that they “*enjoy*”, “*love*”, and had a “*passion*” for nature when explaining their opinions, views, and feelings toward their program. From these responses, it could be suggested that the first-year SNRM students found a held similar sentiment towards their program and the natural environment.

In other words, because the program offered courses in nature the students resolved that they would “*enjoy*”, “*love*”, and have a “*passion*” for the content provided in the AMP, FP, and NCP. Ultimately, the data provided the basis for concluding that the forty-one first-year SNRM students who responded to questions about their views and opinions about their program, in terms of their attitudes towards the natural

environment, might have a connection with nature and that this could be a reason for some of them choosing an environmental field of study.

### **5.1.1. First-year SNRM students' concerns about the future and the economy**

When the first-year SNRM students were asked why they chose to study their programs, the responses were related to their concerns about the natural environment in terms of the future and the economy. Thirty-eight of the first-year SNRM students expressed various concerns related to these topics during the baseline questionnaire. One student said, *"I don't see a future if nature can't be conserved"* (BNS 01). Some nature conservation students elaborated on their concerns by mentioning the negative impact people have on the natural environment and its resources. This was best expressed by statements such as:

*People destroy the beauty of nature so I want to protect the nature in all what I can (BNS 16).*

*Animals need care and animals these days are being killed by poachers like rhinos so we need to protect them (BNS 10).*

*I am against the killing of living organisms because we depend on them. (BNS 05).*

The first-year SNRM students' concerns about the environment extended to their concerns about the futures of the next generations, as in the following example:

*[We] need to secure a future for the next generations...to have this natural resource (BFS 39).*

Seven of the agriculture and eight of the forestry students emphasized their concerns about society, of which the following is an example:

*My rural area gave me a go ahead ability, seeing its poor agriculture...made me believe that if I pursued my dream of being an agricultural manager I can do a lot of difference (BAS 13).*

Preserving the natural environment and the future environment for the next generation “plays a major role in our economy” (BFS 37), which the agriculture and forestry students also expressed as a concern. The strength of the economy enables the Agriculture, Forestry, and Nature Conservation industries to care for and protect nature and secure the environment for the next generations.

### ***5.1.2. First-year SNRM students’ perspectives on contributing to the future and the economy in terms of the natural environment***

Along with the questions about why the first-year SNRM students chose to study their programs, they mentioned that they would like to contribute to the natural environment. The students reflected on securing the natural environment for the next generation as well as explained that they want to promote the natural environment by contributing toward strengthening the economy.

#### Conserving and protecting the environment

Seven forestry and six nature conservation students explained that they wanted to contribute toward a successful future, as in the following extracts:

*[I] want to secure our nature for the next generation after us (BFS 39).*

*[I want to] find ways to sustain and maintain the environment for future use and also ensure that the resources found in the planet are used effectively and shared equally in order for all living things to use them (BNS 07).*

Thirty-eight of the first-year SNRM students stated that they wanted to contribute towards managing, sustaining, and protecting the natural environment. This was best expressed by students who said:

*I want to take care of our livestock and the environment at large (BAS 12).*

*I want to take care of our environment (BFS 27).*



*I want to do best by nature...I wanna make sure that I save and protect nature (BNS 01).*

#### Promoting economic activity for society

Five agriculture and eight forestry students expressed that they wanted to contribute to job creation for society. This was best expressed when a student said, *“I want to make job opportunities for other people in my township” (BFS 43)*. Further, five of the agriculture and six of the forestry students stated that they wanted to promote the natural environment by one day contributing to a stronger economy, as in the following example: *“I want to boost the country’s economical growth through agriculture” (BAS 06)*.

#### **5.2. First-year SNRM students’ understanding of their field of study**

Continuing with the question of why the first-year SNRM students chose to study their programs, the students made direct statements about the program itself. Ninety-six of the first-year SNRM students were informed and aware that their program was related to their field of study. Agricultural students explained that the program was about, for example, *“managing the agricultural sector such as livestock farm[ing], dairy farm[ing], fruit and vegetable farm[ing], etc.” (BAS 03)*. Forestry students explained that, for example, their program was *“all about establishing new compartments, maintaining trees, and turning them into end products for the market” (BFS 12)*. Nature Conservation students stated that, for example, their program was *“about observation and management of plants and animals. Managing their lifestyle and keeping them from getting any harm or from extinction” (BNS 21)*.

Fourteen of the first-year SNRM students were ill-informed about the field of study or the program that they were enrolled in. This was expressed in the following way by two first-year SNRM students when they said, *“at the moment I am clueless” (BNS 20)* and *“I am still willing to learn more about it” (BAS 26)*.

### **5.2.1. First-year SNRM students' feelings about the industry they are training for**

Continuing again with the question about why they chose to study their programs, the first-year SNRM students elaborated on their opinions and views about the industries that they would be working for in the future. Thirteen agriculture and ten forestry students expressed that they looked forward to joining the industry. One student clarified that *"it is an industry of which I always wanted to go into"* (BFS 22).

#### Job opportunities.

All three groups of students indicated that their industry provided a lot of job opportunities (17 students) compared to other fields, and this was also a reason (18 students) they chose to study the specific program. Statements included:

*This course has a lot of opportunities (BNS 23).*

*I chose Forestry because of the current job creations the industry has (BFS 36).*

*I think choosing this career may bring me more opportunities in the career field. Since there's no scarcity of jobs in this particular field (BAS 17).*

#### Gender and race.

Five of the SNRM females shared their opinions about the industry when it came to both gender, based roles and issues around race. Examples of their views include:

*Agricultural studies are often underestimated by youth especially females (BAS 18).*

*There is not a lot of black woman exposed to it (BNS 23).*

*As a female, I love to be hands on in a male dominated department (BFS 29).*

These sentiments from the female first-year SNRM students highlight that some students perceive there is a lack of female, particularly black female representation within these three industries.

#### Role of the industry.

Thirty-one first-year SNRM students elaborated on the role that their industry plays in terms of the natural environment and people. The Agriculture and Nature Conservation students explained the importance of their industry by saying, for example, *“I believe in years to come that agriculture will be key for us to survive” (BAS 14)* and that *“conservation is vital for this planet and the natural order of things for life on earth to thrive” (BNS 13)*.

Twenty-three forestry students mentioned that their industry had a big impact on the ozone layer, in terms of providing oxygen for all. This was best expressed when the students said:

*Forestry provide the atmosphere with a lot of oxygen because there are trees (BFS 49).*

*Our lives depend on it because they [trees] regenerate our oxygen. (BFS 04).*

Across the programs, 23 first-year SNRM students responded that their industry was responsible for managing natural resources, whether managing “a farm” (BAS 11), “forests” (BFS 24), or “natural resources” (BNS 19). Eight Forestry and fifteen Nature Conservation students also mentioned that their industry was responsible for protecting the natural environment, best elaborated on by one forestry student who said, “Forestry is nature based...which allows people to reserve nature and promote biodiversity” (BFS 24).

#### The industry’s relationship with technology.

Five of the first-year SNRM students elaborated on the role technology played in their chosen industries. Agriculture students explained the importance of having technology in their industry, as illustrated by the statement that: *“I want to be one of the first people*

to be able to bring agriculture into the 4<sup>th</sup> Industrial Revolution world we live in” (BAS 18). Forestry and Nature Conservation students explained the importance of balancing technology and nature, as in the following two examples:

*We need to ensure that there is a balance between nature and technology (BFS 24).*

*I know that if the entire earth was to be controlled with technology it would be really hard to survive (BNS 18).*

### **5.3. What first-year SNRM students would like to learn about in the three programs.**

The final question in the baseline questionnaire asked the students what they would like to learn about in their programs as they progressed with their studies. One hundred-and-five of the first-year SNRM students said they would like to improve their knowledge overall. For example, they wanted to “*know*”, “*study*” and “*learn*” about everything their programs had to offer. This was divided into two types of responses, namely first-year SNRM students who wanted to gain insights into their industry and those who were focused on knowledge of the natural environment.

#### **5.3.1. Greater insight into the industry.**

Seventy-one of the first-year SNRM students indicated that they wanted to improve on and learn new skills required for their specific industry. Specific statements include:

*I would like to learn more about agriculture and how one needs to properly run a farm (BAS 11).*

*I want to learn about the mechanic stations and how the machines work (BFS 12).*

*I just want to learn more about the nature around me. Gain more information. How to handle animals and care about the plants. How to feed the animals and how to protect them from harm (BNS 22).*

Thirty-two Agriculture and thirty-eight Forestry students wanted to learn more about the specific industry they would be working in. This was evident from one student's statement that *"I would love to learn more about everything in the field"* (BAS 18).

### **5.3.2. Greater understanding of the natural environment.**

Two Agriculture, twenty-five Forestry, and nineteen Nature Conservation students who participated in the baseline questionnaire indicated that they wanted to learn more about nature, as this is, in fact, the "industry" that they hoped to work in one day. One student said, *"I would like to learn more about nature"* (BNS 12), and another reiterated this sentiment when they said, *"I would like to learn more about animal behaviour, different plantations and also how to work in the field"* (BNS 15).

The results provided thus far were obtained from the baseline questionnaire. At the end of the first semester and after the first-year SNRM students were exposed to their respective ecology modules, the post-intervention questionnaire was distributed.

### **5.4. First-year SNRM students' changed views and perspectives about the environment and their program.**

During the post-intervention questionnaire, the students were asked how their views and perspectives changed in terms of the natural environment as a result of the ecology module. Ten Agriculture and one Forestry student mentioned that their views about the module had changed. An example of a student extending their knowledge in relation to his/her ecological module was explained by an agriculture student, *"I viewed Animal Production as only extensive, I didn't know that Animal Production can be intensive"* (PAS 08).

Eleven of the first-year SNRM students mentioned that their perspectives had changed in terms of how everything on earth was connected. This was best expressed by one student when they said, *"my views have been changed...everything that is living and non-living all affects each other in some way or another"* (PNS 03). The remainder of the first-year SNRM students (12 students) mentioned that their views of the natural environment, specifically, had changed. This was best expressed by students who said that:

*My perspective towards nature has changed instead of being scared a lot and being ignorant of other things about nature I am more considerate now (PFS 10).*

*I see nature conservation differently. Conservation ecology has taught me how to really see my environment (PNS 12).*

### **5.5. Factors contributing to changes in the first-year SNRM students' views and perspectives of the natural environment.**

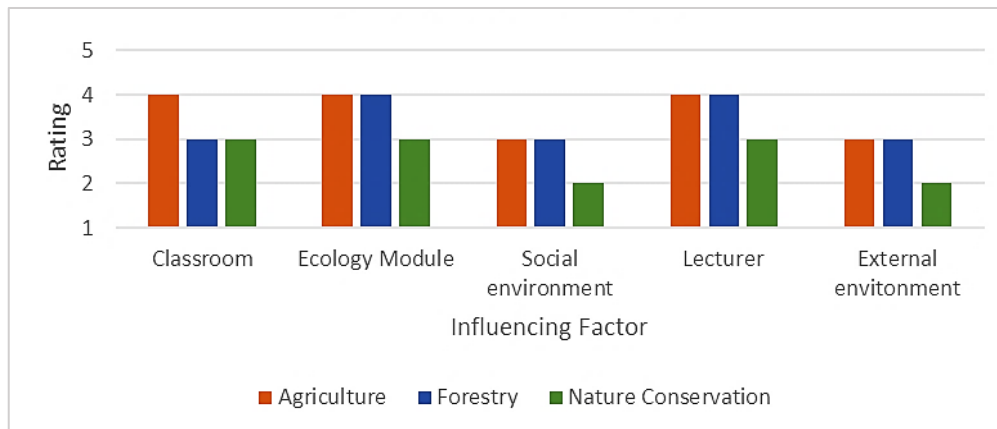
The first-year SNRM students were asked to rate possible factors that might have influenced their change in environmental attitudes and knowledge during the course of the first semester, using of a five-point Likert scale. The scale ranged from very low (1) to very high (5). A list was provided to the students with the following factors: the ecology module, other modules, classmates, classroom environment, family, friends, lecturer, and students in different programs. For the purposes of this research, these factors were all considered to contribute to the classroom environment.

The classroom environment was seen as the physical and online space for teaching and learning. Moreover, the classroom environment was divided into separate sub-groups, namely the classroom itself (physical and online), learning material (the module content), the social environment (friends, family, and fellow students), teaching characteristics of the environmental lecturers, and the external classroom environment (other modules in the program and students in other programs).

#### **5.5.1. The classroom environment.**

All the first-year SNRM students who participated in the post-intervention questionnaire provided a rating for the factors that contributed to a change in their views and perspectives of the natural environment. The classroom ratings were as follows. Sixteen students rated the classroom environment itself, twenty-five students rated the ecology module, thirty-eight students rated the social environment, twenty-three rated the ecology lecturer, and twenty-nine students rated the external environment as having a contribution to a change in their views and perspectives of the natural environment. The social and external environments were broken down

further and are discussed in the next sections. Figure 5.1 provides the average rating that each student group gave for each of the classroom environment factors.



*Figure 5.1 The influence of the classroom environment on first-year SNRM students' views and perspectives of the natural environment.*

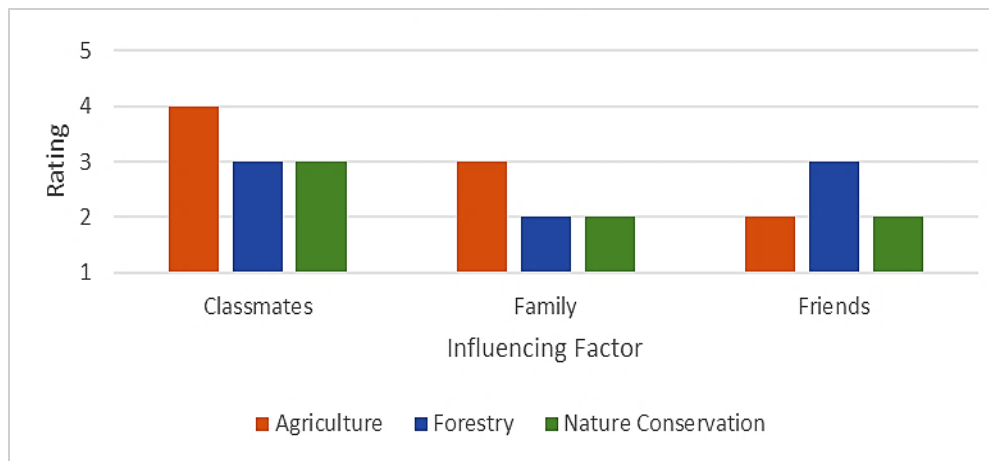
As can be seen from the Figure 5.1, the ecology module and the lecturer were ranked the highest among the first-year SNRM students as a whole. Thus, the ecology module and the lecturer had a middling-to-high influence on changing student attitudes and knowledge. The classroom environment ranked the second-highest rating with a middling-to-high influence. The external and social environment, both ranked the third-highest rating with a low-to-middling influence. However, additional ratings were provided within these last two categories. No additional comments were provided by the students concerning the sub-categories.

#### The social environment.

The social environment was divided into classmates, friends, and family. The first-year SNRM students provided the ratings for these categories as follows. Fourteen of the first-year SNRM students rated that their classmates had a middling-to-high influence on their changed views and perspectives of the natural environment. Eleven of the first-year SNRM students rated that their friends had a low-to-middling influence. There were no specific comments on why friends had contributed to these changes.

Thirteen of the first-year SNRM students rated their family as having a low-to-middling influence. One agriculture student provided an additional comment related to this when it was said that *“the major factor for me is that my family has a small subsistence farm from a young age I enjoyed herding the animals and helping in planting the vegetables”* (PAS 05).

The ratings provided by the first-year SNRM students reflect that the social environment has a middling influence on their changed views and perspectives of the natural environment. **Error! Reference source not found.** provides a summary of the ratings for each category under the social environment.



*Figure 5.2 The social environment influences on first-year SNRM students' views and perspectives of the natural environment.*

### The external environment.

The external environment was divided into other modules within the program and students in other programs. Eighteen of the first-year SNRM students rated other modules within their program as having a middling-to-high influence on their changed views and perspectives of the natural environment. Eleven of the first-year SNRM students rated students in other programs as having a low-to-middling influence. These ratings provided by the first-year SNRM students reflect that the external environment can have a middling influence on their changed views and perspectives



of the natural environment. Figure 5.3 provides a summary of the ratings for each category under the external environment.

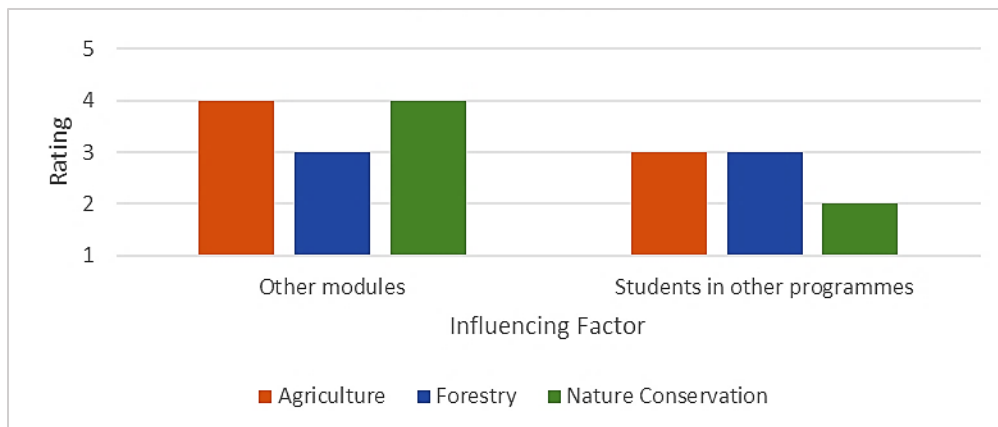


Figure 5.3 The external environment influences on first-year SNRM students' views and perspectives of the natural environment.

### 5.6. What the First-Year SNRM students learned from their ecology modules.

When asked what the first-year SNRM students had learned about ecology and what the module itself taught them, the students' responses related to gaining and improving their knowledge. Thirty of the first-year SNRM students said that they gained and improved on their environmental knowledge through the ecology module. The Agriculture students explained that they learned about agriculture ecology and how to take care of livestock:

*I have learnt about how animals behave and how they react towards their feeds, how they need to be taken care, how important [it] is to look after digestive system of animals in order to have health[y] animals. I have learnt about needs of a young calf, how it should be treated in the first 3 days in order to survive mortality. I have learnt anatomical adaptation of cattles and how they adapt in different places (PAS 11).*

Forestry students explained that they learned about forest ecology, the management of plantations, and that profit does not always have to come first:

*Forest ecology has taught me that there is more to Forestry than just planting trees and making profit from that. It has taught me that forests work or influence the type of vegetation, animals that can be found in a forest or nature conservation. I also learned that to take care and preserve other species except for Timber and to not let greed get the better of me. Although Forest plantation main aim is to make profit, but a Forester also has to have a softer side to nature as some things cannot be bought by money or money cannot fill their gaps once they are gone such as animals and plants. (PFS 10).*

Nature Conservation students explained that they learned about ecology and the different components of the natural environment:

*I have learned about the environment and interactions between each other. The importance of understanding the interactions between biotic and abiotic components of the environment and how these components play a role in certain animals or wildlife occupying a certain area, being dominant or few in a certain area. As well as certain factors that may trigger certain animal behaviour or plant life. (PNS 13).*

### **5.7. SNRM students' online teaching and learning experiences.**

With the onset of the COVID-19 pandemic, the post-intervention questionnaire asked the students to provide their views and opinions about having to rapidly transition to OTL. There were a lot of opinions expressed which related to a change in learning methods, learning preferences, and students' views about the university.

#### **5.7.1. Changed learning methods.**

In terms of their learning methods, eleven of the first-year SNRM students stated that they changed their learning methods. Nine students mentioned that their learning methods changed. *"It [learning methods] has changed a lot...I have managed to find ways of coping and learning, push myself to see things with an open mind" (PFS 02).* Eight students stated that their learning methods did not change. Students said:

*It did not affect anything (PAS 03).*

*Nothing changed for me (PFS 11).*

*My learning methods have not changed much (PNS 09).*

### **5.7.2. Preferred learning approach.**

With having to change their learning methods, students also mentioned their learning preferences. Five of the first-year SNRM students mentioned that they prefer OTL. In particular, one student reported that:

*It became easier for me because in class, it happens that I do not understand the power point presentation and become scared to ask questions and ask you if you can repeat for me but now in the online learning I would pause and right notes on everything, nothing that can skip without me understanding it. I think I now enjoy Forest Ecology 1 more than in class (PFS 05).*

Thirteen of the first-year SNRM students expressed that they preferred face-to-face class sessions. Response in this vein included:

*I prefer the classroom set up (PAS 02).*

*[With online learning] I cannot see the lecturer...and ask him/her face to face to explain something (PFS 06).*

*I prefer face-to-face teaching as it drives my passion to succeed in my field of work (PNS 03).*

### **5.7.3. A different view towards the university.**

OTL affected three of the first-year SNRM students' views towards the university itself. Statements revolved around the communication from NMU George Campus during the lockdown periods, and the rapid transition to OTL. Five of the first-year SNRM students mentioned that communication from the university and lecturers was good and effective. These statements included the following:

*The lecturer gave his best to work with us (PAS 11.)*

*Our lectures put more effort to ensure that we as students have all the information we need (PFS 08).*

*The university helped us a lot by giving information about how to learn from home (PNS 12).*

In contrast to the above, seven students mentioned that communication from the university and lecturers was bad and lacking. In this respect, the following statements were made:

*There have been fewer explanations from lecturers (PAS 07).*

*The lecturers are not interacting with us well (PFS 11).*

*I feel like they didn't communicate with us well (PNS 10).*

#### **5.7.4. Benefits of online teaching and learning according to the first-year SNRM students.**

When asked if the rapid transition to OTL had a positive or negative effect on their studies, first-year SNRM students commented on the personal benefits and challenges that they faced with the rapid transition to OTL. Seven of the first-year SNRM students mentioned that with the rapid transition to OTL they were able to continue with their studies. They also stated that they were able to learn and improve their online skills. This was best explained by a Nature Conservation student who said:

*Learning online has decreased feelings of anxiousness of using technology for learning...and it has also made me more comfortable using an online approach to learning. I can confidently say that I am more 'digitally literate' than I was before the lockdown (PNS 13).*

Eight of the first-year SNRM students stated that they had more time to go through the module material and study.

*Made me to have more time to learn about agriculture (PAS 11).*

*I was able to study whenever I want without first attending the classes on campus (PFS 06).*

*I enjoyed learning from home at my own (PNS 12).*

With this, five first-year SNRM students stated that they gained more independence when it came to having to study online. This was best stated by an Agriculture student who reported that *“it helps us to be independent”* (PAS 11).

#### **5.7.5. Challenges of online teaching and learning according to the first-year SNRM students.**

Although some students benefited from the rapid transition to OTL, some first-year SNRM students found the transition more of a personal challenge. Eleven of the students mentioned that the rapid transition to OTL was hard for them. Some of the students found it difficult to access online resources, experienced difficulties with studying online and found responsibilities at home distracting. Others expressed having a lack of online skills and knowledge to rapidly transition to OTL or found the time limitations difficult to work within. Further, the students also felt the applied elements of the module had been lost, which they found challenging.

When it came to barriers to access to online resources, six of the first-year SNRM students stated that they had difficulties accessing the online material due to network connections. Responses included:

*It has been a barrier to me due to poor network connection (PAS 07).*

*I couldn't cope [with] online learning well due to internet issues (PFS 07).*

*I live in the rural areas where a network is not functioning well (PNS 11).*

Six of the first-year SNRM students stated that they were having difficulties with studying online. This was best stated by a Nature Conservation student who said, *“studying at home has been the biggest struggle...being away from my study group became challenging. I was not always sure I understood the work properly”* (PNS 04). Six students had difficulties with studying at home, as expressed when students said:

*It is very hard adjusting to study at home especially when you have a big family (PAS 06).*

*Being at home is very hard, you can be easily distracted (PFS 06).*

*I always have to wait for them to go to bed and work the whole night because during the day I do chores around the house (PNS 02).*

Six of the first-year SNRM students did not have adequate online skills and knowledge to be able to rapidly transition to online learning. This was best expressed by one student who said: “not all of us are used to computer skills and some of the things we can’t do due to the fact that the knowledge was still not clear enough” (PAS 10). Five of the students also mentioned that they were having trouble with OTL due to time limitations. Students said:

*I did not have enough time to study (PAS 07).*

*I had less time to prepare for formal assessments (PFS 03).*

*I didn't have time to study my work (PNS 08).*

Having the applied element of their modules fall away was one of the bigger challenges for nine of the first-year SNRM students. Responses in this respect included:

*Animal reproduction requires you to be on practical and learn through the prac (PAS 10).*

*The module needed on field experience and we never received any (PFS 11).*

*We normally should have studied mostly in the field and getting to know some stuff and experience more in the course since our course is done practical. Now we are doing things theoretically (PNS 08).*

## **5.8. SUMMARY**

In summary, the results from the questionnaires with the first-year SNRM students provided various insights about their views and opinions on the natural environment, their programs, and the industry that they hoped to work for one day. The key findings from the questionnaire results that supported the study’s objectives were the baseline environmental attitudes and knowledge of first-year SNRM students and how they

changed in terms of the natural environment, their programs, and the industry; the contributions of the classroom environment on the first-year SNRM students' perspectives; and the influence of OTL.

## **CHAPTER 6: THREE ENVIRONMENTAL LECTURERS' PERSPECTIVES ON ENVIRONMENTAL EDUCATION**

The results for the data obtained from the semi-structured interviews conducted with the environmental lecturers who teach the three ecology modules for the three programs are presented in this chapter. The interviews were designed to obtain data for objective three and objective four which was: to understand what type of teaching approaches were used by environmental lecturers teaching the ecology modules and to understand how the teaching approaches of the environmental lecturers influenced baseline environmental attitudes and knowledge of first-year SNRM students.

The first interviews took place before COVID-19 lockdown regulations were put in place and provided insights into the environmental lecturers' views on first-year SNRM students, teaching approaches, teaching materials, and methods, teaching impacts, and teaching limitations. Taking the rapid transition to OTL into consideration, the follow-up interview was designed to obtain data for objective five which was: to understand the experiences of first-year SNRM students and the environmental lecturers who had to rapidly transition to OTL.

### **6.1. Environmental lecturers' views on first-year SNRM students.**

The environmental lecturers were asked what their views of the first-year SNRM students were when teaching them the ecology module. Each lecturer expressed their views about the first-year SNRM students in general. Specific comments concerning the African students were also made. The environmental lecturers' views on the first-year SNRM students were grouped into themes related to their schooling, perceived state of mind, and how they changed throughout the semester.

In terms of schooling, the environmental lecturers mentioned that the exposure students had during school played a role in their confidence levels. This was best described by L1 when he said:

*I think it is more of the exposure that or the schools that they have been to. There is other type of education systems where you are actually instilled with more confidence than others. Others become too*



*submissive and when they are here, we say no there is no submission here. You need to be active, and it is something that they are not use to.*

L3 added to this conversation by saying:

*We never really test the education they received before coming to university, what they already know when they come here. We need to delve a little bit more [into] what students know. To say 'Okay, well, these students know a lot about this and nothing about that or not a lot about these different topics. I do not think people are placing enough emphasis on that. There is no standard.*

All three lectures noted that the first-year SNRM students have a perceived state of mind as they were feeling unfamiliar and lost at first. L2 best expressed this, as follows: *"I think in the beginning of the semester they maybe still don't know the ropes as well".* This does appear to change as the students progressed through the module *"I think some of them are also a little bit more relaxed as the semester progresses and some of them start enjoying the subject"* (L3).

The three environmental lecturers also shared opinions on first-year SNRM black rural students, in particular. L1 mentioned that the background of African students plays a big role in their first semester, noting that:

*The different backgrounds of the students determine quite a lot of how well they will take off from their first semester. Most of our black rural type of students take time to get into the groove of things. It is based on the exposure or the schools that they have been to.*

L2 commented that the black rural students struggle in terms of the language barrier. The lecturer mentioned that English was the main barrier in teaching and learning in the first-year SNRM students and that this stemmed from the education that they received in school:

*English is the main barrier to our students. It seems that students at school level do not learn the correct context of things. They know how to study in a parrot fashion, they can give you the words that you need, the*

*keywords, but they do not know what those words mean. That is a big frustration. I think it is a deficien[cy] from the schooling system...I think the biggest problem that they have is English...they can't write proper[ly] and it seems that the comprehension of certain words just isn't there.*

Although the university does offer a solution for these students, the lecturer stated that it was not the most effective solution. *"The idea is that the students who struggle do the module called English B, but it is not an instant fix. In the first semester, they are definitely going to struggle"*. The lecturer stated that they try to overcome the language barrier by giving the students a glossary *"... of the main terms that we use"*.

L3 stated that the main problem experienced by the African students was plagiarism. Observing that *"Most of the heavily plagiarized essays come from the first-year African students"*, the lecturer noted that the students do not know about plagiarism when they first arrive:

*The first time they hear about plagiarism is when they come to university. Before that no-one cares or know about plagiarism...we forget that it's probably how they were educated in school. [Thus] students do not understand why we are penalizing them.*

Apart from plagiarism, L3 expressed that some of the black rural students had a great passion when it comes to learning. *"The passion in many of them is amazing, the willingness to learn"*. The lecturer also noted that the assignments that they receive from these students were very good compared to the other students, noting that *"some of the best essays that I have read come from the first-year African students"*.

## **6.2. Teaching approaches of the three environmental lecturers.**

The three environmental lecturers were asked what their teaching approaches were for the ecology modules within the respective programs - AMP, FP, and NCP. Each lecturer explained their teaching approach in various ways and expressed various opinions throughout the interviews on how they go about teaching the first-year SNRM students about ecology. However, all three lecturers stated that this differed from what

they were taught when they were in university. This was best expressed by L3 who said:

*I had very different lecturers from what the students have now, but I have taken some of the best aspects from the different lecturers I had, and I have tried to use that in my approach.*

The teaching approaches of the three lecturers revolved around bringing students to the same level of understanding, taking on an applied and multidisciplinary approach, making use of local examples in the George area and African examples across different biomes, and building relationships with their students.

### **6.2.1. Getting students to the same level**

Before making progress within the module, the environmental lecturers' approaches were often to bring their students to the same level of understanding. L1 explained this when he mentioned that *"I see on the footing where they are, and then we move from there"*.

### **6.2.2. Applied and multi-disciplinary**

The environmental lecturers also adopted an applied and multidisciplinary approach to OTL which was best explained by L1 when he said:

*The approach that I have is more of an interactive, visual type of learning approach and a very practical approach...I have to bring in that multidisciplinary aspect so that the students are much more aware [of] certain aspects that influence or affect animal production.*

### **6.2.3. Using local and African examples**

All three lecturers made use of the campus surroundings and African examples of ecology when teaching. L2 stated, *"I like to take a walk on campus and then show them the things we talked about...what I like about it is that it is African examples. A lot of times the examples we get is the stuff that we don't know. We don't know about wolves, elks, and things. It is not something that we deal with"*.

All three lecturers noted that their teaching approach for the module may differ from the other two environmental lecturers in terms of the way the module content was provided. L1 best explained this when he said, *“It is part of what I have to apply that may be slightly different from whoever is teaching plants”*.

#### **6.2.4. Building relationships with the students**

L2 explained that it was important to have a relationship with students as it played a role in the effectiveness of their teaching approach. He said, *“It’s more than just the content of the module. It is important that you build a relationship with your students”*. Relationship building with students can become problematic if students hesitate to participate in class: *“one of the big problems I have with my classes is that they don’t participate, so you will ask questions and they just sit there and stare at you”*.

#### **6.3. Lecturers’ perceptions of the impacts of their teaching approaches.**

The three environmental lecturers expressed a range of opinions about the impact their teaching approaches had on the first-year SNRM students. Each lecturer mentioned the same set of impacts, except when it came to providing the students with what L1 and L2 conceptualized as *“realistic views”* of the world and how ecology works. L3 did not share the same sentiment.

All three lecturers felt their approach prepared their students for a career in their specific field. This was best explained by L1 who said, *“the idea is that eventually they will be involved in farming enterprises. By understanding the industry very well it sets them up to be successful, confident managers or farmers one day”*. L1 and L2 supplemented this by stating that their teaching approach provided students with a realistic view of the world: *“I hope that if they complete my class that they would have a more realistic view on the world”* (L2).

Furthermore, environmental lecturers across all the programs felt that their approach contributed to a change in the students’ knowledge and understanding. All three lecturers expressed how their approaches aimed to shift students’ interest towards their specific field of study, as far as:

*Animal Production increases their confidence and understanding and aspiration of becoming farmers (L1).*

*They need to know more than just about trees. Population dynamics, and all kinds of things (L2).*

*I try to get them a little more interested in plants and how the animals and plants are interlinked (L3).*

The aim to shift students' interests was best expressed by L3 lecturer when it was said, "*students need to understand everything, or gain knowledge about a variety of things, for everything to make sense*".

#### **6.4. Limitations of environmental lecturers teaching approaches**

The environmental lecturers mentioned a few limitations of their teaching approaches when asked to elaborate on the challenges they experience when teaching the ecology module. L1 explained that the class size and limited funding influenced the methods of teaching that he used:

*I am unable to perform certain functions with the students. In general, the module is a practical course. I have to take the students on practical outings, take them to the laboratory to do dissections, identify certain organs. We should visit farms to identify and observe different types of animal breeds... funding and class size are a limitation when it comes to practicals and a huge limitation towards my teaching.*

L2 experienced similar limitations when it came to class size. However, workload and time constraints also played a role. As L1 had explained, class size was a limitation for L2 when it came to taking students out on practical excursions:

*I've got 80 students and to go out and find a place where everybody can hear and see makes it difficult. It takes a lot of planning to make that work. You cannot go and try to do these novel things if you are not going to have improved the quality of learning for the students.*

Time was also a big factor for L2 as his workload increased and the time allocated to teach the students decreased:

*The challenge this year is that our academic contact time has been reduced compared to previous years. Each semester, the workload that we have and other things that are expected of us, prevents you from finding the time to implement cool stuff available to us.*

L3 lecturer had a similar response to that of L2 when it came to time being a limitation:

*The periods were shortened and now I only get 2 hours of class-time for a subject. We lose an hour and a half every week. In the past, you had more time...it is definitely an issue.*

### 6.5. Materials and methods used by lecturers

The environmental lecturers were asked about the materials and methods they use when teaching their ecology module. The three lecturers mentioned various materials and methods that they used when teaching a class, as recorded in Table 6.1 (type of materials) and Table 6.2 (method).

*Table 6.1. Materials used by each of the three environmental lecturers.*

Material	Lecturer		
	Lecturer 1	Lecturer 2	Lecturer 3
Journal articles	✓	X	✓
Notes pack	X	✓	✓
Study guide	✓	✓	X
Presentations	✓	✓	✓
Videos	✓	✓	✓

*Table 6.2. Methods used by each of the three environmental lecturers.*

Method	Lecturer		
	Lecturer 1	Lecturer 2	Lecturer 3
Spot checks	✓	✓	X
Assignments	✓	✓	✓
Tests	✓	✓	✓
Excursions	✓	✓	✓
Teamwork	X	✓	X
Online virtual classes	✓	✓	✓

As noted in Tables 6.1 and 6.2, each lecturer made use of their own materials and methods, which were similar to the other lecturers. There were some differences when it came to making use of materials such as journal articles, note packs, study guides, and methods such as spot checks, and teamwork projects.

## **6.6. Online teaching approaches of the environmental lecturers**

Follow-up semi-structured interviews with the three environmental lecturers were conducted at the end of the semester, to answer how the rapid transition to OTL influenced their teaching approaches. The environmental lecturers mentioned that they had to adapt their teaching approaches in terms of taking on an online teaching approach, making use of online assessments, and the benefits and challenges they experienced with online teaching.

### **6.6.1. The environmental lecturers adapting their teaching approaches for online delivery**

With the rapid transition to online teaching, all three lecturers stated that they had to adapt their teaching approach. L1 said, *“I have had to change so many things. I have had to adapt to certain aspects”* (L1). L2 was the only one who stated that, although they had to adapt to online teaching, they did not have to change their teaching approach, stating that *“The way that I’ve [been teaching] ...hasn’t changed much”*.

Both L2 and L3 started making use of video-based classes to teach online. L3 said, *“the main tool I use now is a lot of videos that I have compiled”* (L3). This method was beneficial for both lecturers when it came to online teaching. However, L1 and L2 both mentioned that it becomes frustrating at times to adapt to online teaching. L1 said, *“it feels like I am talking to myself...it is frustrating”* (L1).

### **6.6.2. Assessing students online**

The three environmental lecturers adopted new methods to assess their students online. All three lecturers started making use of quizzes and worksheets. L2 and L3 also made use of reflective essays. Lecturers mentioned that making use of these

tools to assess their students proved to be challenging because, as one said, *“It has been difficult for me to determine whether the students have understood what I am trying to teach them”* (L1). This made grading the students difficult as it was *“much more intense”* (L2) to mark online assessments. This brought about *“a lot of confusion...about lecturing [online]”* (L3).

### **6.7. Benefits of online teaching according to the environmental lecturers**

Two environmental lecturers identified a few benefits that they derived from the rapid transition to OTL. L1 was the only lecturer who did not mention any benefits with online teaching saying he did not *“see any benefits for me or the students”*. L2 and L3 both agreed that online teaching allowed them to reuse certain materials for future teaching. L3 mentioned this in terms of the videos that he used. *“I am going to keep using videos for future subjects...even when the pandemic is over”*. According to L2, this shift to OTL has been *“a blessing in disguise...it has forced a lot of people out of their comfort zones. It is something that should have been done years ago”*. L3 mentioned that being able to work from home was *“actually amazing...not being an extremely social person, I don’t mind the online teaching”*.

Two of the environmental lecturers also mentioned some benefits the students might derive from the rapid transition to OTL. L2 mentioned that students may have been able to save some money with the rapid transition to OTL. The lecturer also mentioned that there were *“a lot of opportunity for growth in skills...[students] also had to go through this learning curve of dealing with the online environment”*. L3 mentioned that students had access to online materials at any time and place, which allowed them to *“listen, pause, and then make notes...they have more time to go through the work”*. This could ultimately *“eliminate the intimidation of [students] being in class and reduce the stress associated with exams and re-exams”* (L3).

### **6.8. Challenges of online teaching according to the environmental lecturers**

The environmental lecturers identified a few challenges that they encountered while transitioning to online teaching. All three lecturers noted that the rapid transition to OTL was time-consuming. L3 explained this in terms of having to make videos, reporting that *“the recordings take a long time, it can take up to 3 days to do the*



*recording, edit it, and send it to the students*". This could *"take away a lot of the time you have available to focus on...your online delivery to the students"* (L2). L3 mentioned that it was hard to *"balance personal and work life"* when focusing on online teaching. L2 stated that academic duties increased because of the rapid transition to OTL. *"We have endless meetings...there are some weeks where almost every day I have meetings the whole day"*. This hinders the lecturer's ability to *"give more attention to the modules that I'm teaching"* (L2).

### **6.8.1. Lack of effective communication from students**

The three lecturers reported that they faced a lack of effective communication from the students. This was best explained by L2 when he said, *"communication from students is almost non-existent. They don't tell you about problems that they are having...don't know about the problems [that they have]"*. This was presumed to be due to the limited access students had to online resources.

L1 said, *"Access to the [online] resources become a serious problem for the students"*. The three environmental lecturers were accustomed to contact sessions with their students, where communication with them was easier. L2 and L3 also noted that it was not just the students who lacked effective online communication, but that *"communication from the university, both from the lecturers and the university, as a whole is inadequate"* (L2).

### **6.8.2. Challenges with an applied teaching approach**

L1 and L3 noted that the applied approach to teaching had fallen away, making teaching problematic as *"students are very hands-on and practical. They learn by seeing, doing, touching, and feeling. Having lost all of that...is a disadvantage"* (L1). L1 continued by saying that their students:

*Are not quite knowledgeable or experienced in terms of writing and reading. Most of [them] are coming from a background where they do not know or cannot differentiate between a meat breed and dairy breed.*

This was problematic for the lecturer as their students *"struggle to answer some of the [online] applied questions if they don't have a background in farming"*. The students

had no choice but to conduct these applied elements online. Both L1 and L2 stated that it was not ideal for their students as, in the words of L1, they *“could be feeling that they are being pushed into something that they don’t like doing”*.

### **6.8.3. Work overload**

L2 and L3 stated that students may also feel that the workload was too much with the rapid transition to OTL. While L2 reported that *“From a student’s perspective they feel that... there’s too much work”*. L1 mentioned that some of their students decided to *“quit their studies because of the transition to online”*.

L3 mentioned that a solution for students to cope with all the work and stress was effective time management and said that:

*I would recommend that students set up times to work through their lectures at certain times...some students are not able to attend a lecture at 9 or 10 in the morning. They should say then I am going to work at this time and after this time I am not working... flexibility is key.*

Time management, it was stated, will work well if students take it one step at a time. L2 mentioned that students tend to over-complicate OTL. *“Students are their own worst enemy. They make a mountain out of a mole’s heap. In this case, the worksheets [that I give them online, they are not able to] answer because they try to overcomplicate it”*.

## **6.9. Summary**

In summary, the results of the semi-structured interviews with the three environmental lecturers provided various insights about their views on the first-year SNRM students, their teaching approaches, and their experiences with the rapid transition to OTL. The key findings from the interview results that supported the objectives of this research were the environmental lecturers’ views on their students, their teaching approaches, the contributions they made, and the influence of OTL on the three environmental lecturers’ teaching approaches. Comparing these findings with the results from the questionnaires provided an in-depth dialogue that answered the research objectives.

In concluding the results from this study, Table 6.3. Summary of the results in relation to the research key questions, aims, and objectives. The table breaks down how the results in Chapter Five and Chapter Six relate back to and answer the key questions, aims, and objectives of this research.

Table 6.3. Summary of the results in relation to the research key questions, aims, and objectives.

Key question	Aim	Objective	Relevant result section
What were the baseline environmental attitudes and knowledge of first-year SNRM students and how did they change during the course of an ecological module?	Understand the first-year SNRM students' baseline environmental attitudes and knowledge and how they changed through an educational intervention, namely an ecology module.	1. Establishing an understanding of the baseline environmental attitudes and knowledge of first-year SNRM students who were undertaking one of three SNRM ecological modules.	5.1. First-year SNRM students' views and opinions about the natural environment. 5.2. First-year SNRM students understanding of their field of study. 5.3. What the first-year SNRM students would like to learn about in the three programs.
		2. Assessing the changes in the first-year SNRM students' environmental attitudes and knowledge after the education intervention, namely an ecological module.	5.4. First-year SNRM students' changed views and perspectives about the environment and their program. 5.5. Factors contributing to changes in first-year SNRM students' views and perspectives of the natural environment. 5.6. What the First-Year SNRM students learned from their ecology modules
	Identify the educators teaching approaches and how they influenced the first-year SNRM students.	3. Understanding what type of teaching approaches were used by three environmental lecturers teaching the ecological modules.	6.1. Environmental lecturers' views on first-year SNRM students. 6.2. The teaching approaches of the three environmental lecturers 6.5. Materials and methods used by the lecturers
		4. Evaluating how the teaching approaches of the three environmental lecturers influenced the baseline environmental attitudes and knowledge of the first-year SNRM students.	6.3. Lecturers' perceptions of the impacts of their teaching approaches. 6.4. Limitations of the environmental lecturers teaching approaches.
Understanding the experiences of first-year SNRM students and the three environmental lecturers in transitioning to OTL	Understand how a transition to OTL impacted both the first-year SNRM students and the three environmental lecturers	5. What were the first-year SNRM students and three environmental lecturers' experiences of having to transition to online learning and teaching?	5.7. SNRM students' online teaching and learning experiences. 6.6. Online teaching approaches of the environmental lecturers 6.7. Benefits of online teaching according to the environmental lecturers. 6.8. Challenges of online teaching according to the environmental lecturers

## **CHAPTER 7: DISCUSSION**

This research set out to understand the environmental attitudes and knowledge of the first-year SNRM students and how it changed after an intervention, namely the ecology module. The ecology module was offered by three environmental lecturers. Their teaching approaches for the module were identified to understand how they contributed to a change in the first-year SNRM students' environmental attitudes and knowledge.

The environmental lecturers also provided a brief overview of their perceptions of first-year SNRM students' state of mind and knowledge as they started with their academic journey and how their emotions and feelings changed in the course of their ecology module. This information offered additional insights into the first-year SNRM students' environmental attitudes and knowledge.

Due to the pandemic of COVID-19, this research also aimed to understand how a rapid transition to OTL had impacted both the first-year SNRM students and the three environmental lecturers.

The following discussion intends to explain and elaborate on these research objectives, in relation to the literature review, and in terms of the key findings from chapters 5 and 6.

### **7.1. Baseline environmental attitudes and knowledge of the first-year SNRM students and how they changed**

The first objective for this study was to understand the baseline environmental attitudes and knowledge of first-year SNRM students. The second objective for this study was based on understanding how the first-year SNRM students' environmental attitudes and knowledge changed, after their exposure to an ecology module within their program.

The baseline environmental attitudes and knowledge of the first-year SNRM students were centered around the natural environment and the industry they were preparing to enter. Their views, opinions, and attitudes about the natural environment and their

understanding of their program and the industry all contributed to their reasoning as to why they wanted to go into an environmental field of study. Students expressed concern for the natural environment, future generations, and the economy, showing that they had a connection with nature.

#### ***7.1.1. SNRM students' baseline attitudes and knowledge about the natural environment and how they changed***

In this research students at first stated that nature was important to them because they had a connection to it. Although the first-year SNRM students showed a connection with nature, they did not show an understanding of the ecological concepts behind the natural environment. Multiple researchers (Al-Naqbi & Alshannag, 2018; Norhaidah & Idros, 2006; Schuch & Henriksen, 2013; Wallen et al., 2019) have said that the EE that students received before university does not provide them with suitable knowledge about the natural environment, which leads to a lack of understanding of environmental concepts. This does appear to be evident in this research. However, the same researchers have also stated that students who had a good understanding of environmental concepts tend to have a concern about the environment and will want to contribute to protect and manage it. My research shows that this is not necessarily true. Students may show a concern for the environment without a deeper understanding of ecological concepts or prior knowledge about the natural environment, and still foster concern towards it.

According to what the first-year SNRM students and environmental lecturers stated throughout the research, it appears that some of the first-year SNRM students' environmental attitudes and knowledge did change as the semester progressed. It seems that, through the ecology module, students were able to increase their understanding of the natural environment and ecological concepts. Their perspectives also appeared to have changed when it came to the program, the ecological module, and the industry.

### ***7.1.2. SNRM students' baseline attitudes and knowledge of the program and the industry and how they changed***

The research showed a particular connection between job opportunities and why some of the first-year SNRM students chose to study a specific environmental program. A few researchers (Astin et al., 2010; Gallup, 2014) have said that students tend to pursue a specific field of study to secure a job within the industry. According to Searle & Bryant (2009), this is especially the case for students who decide to study environmentally orientated courses or degrees in the environmental sector, specifically in terms of the forestry industry.

According to the first-year SNRM students and additional commentary from the environmental lecturers, the students' opinions about the program and industry changed as the first semester progressed. Gaining new skills and learning about what the industry has to offer could influence students' perspectives about their program and field of study. This appeared to be the case for the first-year SNRM students in this study. It seemed that through exposure to the ecological module, the students' knowledge of ecological concepts and how it plays a role in their industries developed their understanding of their industry's role in sustainable practices.

### ***7.1.3. Environmental lecturers' views about their students***

The environmental lecturers are frequently interacting with their students and therefore were able to provide insights into the attitudes and knowledge of students and to explain how they changed through exposure to the ecology module. In this research, the three environmental educators expressed a few opinions on the first-year SNRM students. Apart from the students being shy at first and becoming more confident as the semester progressed, the comments around the students' background and schooling made by the environmental lecturers were most distinct. Students have diverse backgrounds in terms of their education (Schuch & Henriksen, 2013) and demographics (Dumford & Miller, 2018). This appeared to be evident in this research as the environmental lecturers verified the diversity of their students' backgrounds, referring to African students, rural and non-rural located students, and home language differences.

The environmental lecturers also emphasized that students' school background played a significant role in their confidence, knowledge, and understanding of what the environmental lecturers teach in their ecological modules. Schools play an important role in developing students' environmental attitudes and knowledge. As some researchers have mentioned (Makokotlela, 2016; Ramadhan et al., 2019; Schuch & Henriksen, 2013) schools do not always appropriately incorporate EE into their curriculum and therefore do not always equip students with strong environmental attitudes and knowledge. This appeared to be the instance for this research and may have been the reason why some of the first-year SNRM students had a lack of confidence, knowledge, and understanding of environmental concepts at first.

## **7.2. Teaching approaches of environmental lecturers and how they influenced the first-year SNRM students' environmental attitudes and knowledge**

Objective three and objective four set out to understand the teaching approaches that each of the environmental lecturers adopted in teaching their ecology module. This helped to build an understanding of how their approaches influenced the students' environmental attitudes and knowledge. The environmental lecturers explained their teaching approaches and elaborated on what they hoped to achieve by implementing their specific teaching approaches.

This research showed that the three environmental lecturers all adopted an applied and multidisciplinary teaching approach that aimed to shift the student perspectives and understanding of the natural environment. Authors such as Boca & Saraçlı (2019), Norhaidah & Idros (2006), and Schuch & Henriksen (2013) advocate these teaching approaches as the best way to develop students' environmental attitudes and knowledge by increasing their knowledge and understanding of the natural environment. This observation appeared to be supported in this research as the three environmental lecturers mentioned that they could see a shift in students' perspectives and understanding as they progressed with the ecology module.



### **7.3. Influence of the rapid transition to online teaching and learning**

Transitioning to OTL was one way in which the NMU George Campus could proceed with the academic year despite the COVID 19 pandemic. objective five set out to understand the influence of the rapid transition to OTL, as experienced by the first-year SNRM student and the three ecologically lecturers. In this research, I found that the rapid transition to OTL included both benefits and challenges that both participant groups mentioned.

#### ***7.3.1. Benefits of the rapid transition to online teaching and learning according to first-year SNRM students and environmental lecturers.***

This research was able to identify the benefits that both the first-year SNRM students and the environmental lecturers mentioned. Two benefits that were mentioned by both groups were in terms of skills and time. With reference to the skills, both first-year SNRM students and the environmental lecturers mentioned that, with the rapid transition to OTL, the students, in particular, were able to gain and increase their online skills. However, this was not the experience of all students, as some stated that they did not have the necessary skills to be able to rapidly transition to OTL, making it harder for them to adapt as they were unable to gain and improve on their online skills.

According to Verawardina et al. (2020), to successfully continue with OTL institutions, educators, and students must know the online teaching and learning process and obtain the skills. Given that some of the first-year SNRM students did not have the necessary skills to be able to rapidly transition to OTL, it is clear that NMU George Campus should try to incorporate more opportunities to prepare and teach their students the necessary online skills.

In terms of time, both first-year SNRM students and the environmental lecturers stated that students, in particular, were able to pursue their studies at their own pace and time. Verawardina et al. (2020) confirm that online learning can allow students to be more flexible with their learning. OTL can also encourage students to be more independent learners.

Overall, there seemed to be a few positive benefits that the rapid transition to OTL had for the first-year SNRM students and the environmental lecturers. However, the challenges were more prominent.

### ***7.3.2. Challenges of a rapid transition to online teaching and learning according to first-year SNRM students and environmental lecturers***

The challenges identified in this research for both the first-year SNRM students and the environmental lecturers were in terms of access to online materials, the demands of personal responsibilities, the applied elements of the ecology module, the lack of good communication, and time constraints.

#### Access to online materials.

Having access to online materials was a challenge for students specifically. At first, the environmental lecturers did mention that being able to study online provided students with better access to online materials. However, they did note that this could be a problem as well. Not all students had access to these online resources (as similarly observed in research by Mathiba (2020), Pragholapati (2020), and Verawardina et al. (2020)). This was especially true for South African students as the country remains a third-world country with many students coming from poor or underprivileged areas. Mathiba (2020) elaborates on this by mentioning that many of these students do not have access to computers and internet facilities. The first-year SNRM students, in particular, said that access to the online materials was inhibited by poor network connections in their communities.

The students' background and circumstances can be a factor influencing the success of OTL at NMU George Campus. The challenges faced with OTL in SA are not avoidable, but efforts were made to mitigate these issues when the COVID-19 pandemic struck. The National Student Financial Aid Scheme (NSFAS) worked towards ensuring all students in the country had access to online resources by providing laptops and connectivity to online teaching sites (Ensor, 2020). This appeared to be a good initiative, but still, not every student was able to obtain these resources.

### Applied element of the ecology modules

When it came to the online transition, the environmental lecturers found the applied teaching approach difficult. The AMP, FP, and NCP rely on an applied approach to teaching (e.g., excursions and practical demonstrations). Having that element of the modules reduced because of OTL made it a lot more challenging for the environmental lecturers.

With online teaching being introduced at NMU George Campus, the three environmental lecturers were faced with having to manage the grading and evaluation of applied components online. Additionally, they had to determine whether students were equipped to progress within the ecology module through online assessments. Not only did they have to worry about their evaluation methods, but they were also faced with having to adapt to online teaching approaches. Gonzalez et al. (2020) state that lecturers have to either start with new online approaches or adapt their previous online teaching methods. This was the case for participants in this research.

Environmental lecturers specifically rely on interactive and applied teaching approaches. Having to rapidly transition to OTL can become challenging when interactive and applied approaches have to be transitioned to online, without compromising important module content (Dumford & Miller, 2018). The first-year SNRM students also mentioned that having the applied element of their modules fall away was hard for them. The majority of the first-year SNRM students also stated that they preferred having face-to-face lectures. With the applied elements of their programs reduced as a result of OTL, students were not able to experience their module content in a fully applied way at home.

### Lack of good communication.

Communication was also identified as a challenge to both first-year SNRM students and the environmental lecturers. Independently, the environmental lecturers mentioned that the students did not communicate with them as well as they hoped. Dumford & Miller (2018), explain that communication platforms provided by universities or lecturers are not always taken up well by students as they can come across as being superficial for the students in comparison to face-to-face

communication. The first-year SNRM students confirmed this when they mentioned that their lecturers' way of communicating with them during the transition was not always well-organized or executed adequately. Collective statements around the inefficient communication from the university itself, from both the first-year SNRM students and the environmental lecturers, were also made. Though communication was not seen as ideal, some first-year SNRM students did mention that the university tried their best to inform them.

## CHAPTER 8: CONCLUSION

This research aimed to understand the environmental attitudes and knowledge of first-year SNRM students and how they changed during the course of an ecological module. Additionally, with the commencement of OTL, this research also aimed to understand the first-year SNRM students' and three environmental lecturers' experiences with having to rapidly transition to OTL.

This research showed that the first-year SNRM students who have registered for either the AMP, FP, or NCP at NMU George Campus had multiple baseline attitudes and knowledge in terms of the natural environment, the program, and the industry. These baseline attitudes and knowledge appeared to change with the exposure to the ecology module and the contribution of the teaching approaches of the three environmental lectures during the first semester. In terms of the rapid transition to OTL, both the first-year SNRM students and the three environmental lecturers elaborated on the benefits and challenges they faced throughout the process.

### **8.1. First-year SNRM students' baseline environmental attitudes and knowledge.**

The baseline environmental attitudes and knowledge showed that the first-year SNRM students did not have a deep understanding of ecological concepts (knowledge) prior to starting their program at the university, but they did show a concern for the natural environment (attitude). Thus, it may be concluded that first-year SNRM students that enter NMU George Campus may not necessarily have a well-established baseline environmental knowledge. This can become problematic for those first-year SNRM students who do not have any background knowledge or understanding of environmental concepts when commencing with the AMP, FP, and NCP.

As has been mentioned, universities have the potential to build upon students' baseline environmental attitudes and knowledge. The three environmental lecturers at the SNRM do consider this as they try to get all their students onto the same level of understanding before making progress within the ecology module. They also engage in multidisciplinary teaching. However, this research was only able to identify these teaching approaches for the ecology module within the three SNRM programs. Further

investigation is needed to determine whether similar outcomes are derived from the other modules within the AMP, FP, and NCP and whether the lecturers teaching those modules also make use of similar teaching methods.

#### ***8.1.1. Connection between the SNRM programs and job opportunities.***

A point of interest within the findings of this research was the first-year SRNM students' motivation to study within the AMP, FP, or NCP and the job opportunities found in their respective industries. To reiterate, one of the reasons why the first-year SRNM students decided to study their specific environmental program was because of the available job opportunities within the respective industry. The literature on students' environmental attitudes and knowledge has yet to explore or elaborate on how the availability of job opportunities within the environmental industry influences students' environmental attitudes and knowledge.

Students who know about the environmental industry tend to already have some form of environmental attitudes and knowledge, hence why they decide to pursue the industry, which offers them specific job opportunities. The question that could be asked is whether the attractiveness of the environmental industry and available jobs within the industry could lead to students who were not necessarily interested in EE to start with wanting to develop their environmental attitudes and knowledge and, ultimately, directing them to further their EE to acquire the necessary skills and knowledge to obtain a job within the industry.

An alternative question that can also be asked is whether environmental programs and courses are attractive enough to get students interested in EE and, further, the job opportunities associated with it. This all comes down to the marketing strategies of these programs, which should target students at school levels, prior to university. Further research on the connection between job opportunities and students' environmental attitudes and knowledge can help to determine the significance of this connection.

## **8.2. Contributions of teaching approaches of environmental lecturers to changed environmental attitudes and knowledge**

There is, according to the findings of this research, a change in the first-year SNRM students' environmental attitudes and knowledge after undertaking the ecology module in the first semester. My research showed that, according to the first-year SNRM students, they improved their understanding of the natural environment and ecological concepts and changed their perspectives of their ecological module, their program, and the industry after completing the ecology module.

Although my research only investigated the influence of one environmentally orientated module, it showed that according to the three environmental lecturers their teaching approaches did contribute to changing the first-year SNRM students' environmental attitudes and knowledge. Again, this was only the case for the ecology module. Further research is needed to see if all the modules within the AMP, FP, and NCP achieve similar outcomes. It could be of benefit to investigate the AMP, FP, and NCP programs as separate case studies to understand how these programs develop and change students' environmental attitudes and knowledge from first-year, to second-year, and to third-year.

## **8.3. Rapid transition to online teaching and learning at Nelson Mandela University George campus**

My research showed that the rapid transition to OTL had both benefits and challenges for the first-year SNRM students and the environmental lecturers. The findings specifically focused on the corresponding statements of both the first-year SNRM students and the environmental lecturers, reflecting where the first-year SNRM students and environmental lecturers mentioned the same benefit or challenge.

Research on OTL, especially a rapid transition to it, mainly looks at the views and opinions of students and educators separately. My research included both students' and lecturers' experiences with OTL as a shared undertaking. I chose to look at the corresponding statements of my participants as it allowed me to find common ground between the first-year SNRM students and environmental lecturers. This highlighted

that OTL does not benefit or challenge one singular group of people, nor does it mean that each individual is isolated in their experiences with OTL.

Certainly, the first-year SNRM students and the environmental lecturers did experience their own unique benefits and challenges, which should not be overlooked. These should be further investigated and accommodated too. A rapid transition to OTL will not be viewed equally among everyone. Every participant has their own subjective meanings and interpretations of their experiences on the rapid transition to OTL. Nevertheless, showing that there is common ground between the first-year SNRM students' and environmental lecturers' experiences with the rapid OTL could lead to a better collaborative environment. In other words, when it comes to the challenges of OTL, namely having access to online resources, balancing personal responsibilities, limited practical involvement in the course, bad communication, or time constraints - both students and lecturers can work together to combat those challenges.

However, the information presented is only true for the first-year SNRM students and environmental lecturers within the ecology module in the AMP, FP, and NCP. To better understand how a rapid transition to OTL influenced all SNRM students and lecturers, further research is required. Again, I would recommend looking at the AMP, FP, and NCP as separate case studies to understand how these programs experienced a transition to OTL as a whole, across all modules in each of the programs.

Further investigation is also required on how these programs can combat the challenges of OTL, especially in terms of interactive teaching. The rapid nature of transitioning to OTL has slowed down over the last few months of 2020. NMU plans to continue with OTL during the academic year of 2021. There is a lot of potential research that can be undertaken with regard to OTL and NMU.

#### **8.4. Research contributions**

This research drew from researchers such as Al-Naqbi & Alshannag (2018), Norhaidah & Idros (2006), Ramadhan et al. (2019), Schuch & Henriksen (2013), and Wallen et al. (2019) to understand first-year students' environmental attitudes and knowledge and how they change at university. My research builds upon the research by Schuch & Henriksen (2013) by understanding the baseline environmental attitudes



and knowledge that students have at the end of their school careers, with which they enter university. Looking at the NMU George Campus specifically, identifying and understanding the baseline environmental attitudes and knowledge of their students can aid them in developing a curriculum that caters to the diversity of students' environmental attitudes and knowledge. This can lead to opportunities for the SNRM, in particular, to strengthen their first-year environmental programs to establish a strong starting point for their students. Doing so can provide first-year students with the opportunity to reinforce their environmental attitudes and knowledge early on in their academic career, ultimately, providing them with a solid foundation to work from in their second and third year.

This research also leads on from that done by Ramadhan et al. (2019) as I investigated the teaching approaches of environmental educators. My research provided insights from environmental educators, which added to the conclusions made by (Norhaidah & Idros, 2006), in terms of innovative teaching methods. These conclusions also specifically provided insights into the teaching methods within the SNRM at NMU George Campus. Both environmental lectures and the SNRM can use these insights to further explore, develop, expand, or adjust the teaching approaches of environmental lectures within the SNRM to best meet their learning outcomes and objectives.

By looking at first-year SNRM students' environmental attitudes and knowledge at the NMU George Campus in South Africa, my research also provided a comparative narrative to the research done by both Al-Naqbi & Alshannag (2018) and Wallen et al. (2019). When it came to the context of OTL, my research added to the work by Jeong & So (2020) by understanding how a rapid shift to OTL influenced the experiences of first-year SNRM students and the environmental educators at NMU. Looking at the students and lecturers at NMU George Campus exclusively, their experiences and personal insights on NMU's approach to a rapid shift to OTL are of great value. NMU can make use of this information to further develop and improve its OTL approaches. Taking into consideration that both students and lecturers can have similar and contrasting experiences with OTL. NMU can develop their OTL approaches to

accommodate students and lecturers as a collective and adjust them to cater to students and lectures individually.

### **8.5. Additional recommendations**

Apart from further investigating the AMP, FP, and NCP programs individually, how environmental job opportunities connect with environmental attitudes and knowledge, and OTL at NMU, the results of this research lead me to recommend that future studies should consider utilizing both online and face-to-face research tools. Having students fill out questionnaires online proved to be useful as it saved on resources and distribution time, but it did come with the challenge of limited participation.

A personal connection with students remains important, thus I would suggest having regular face-to-face interactions with them even when making use of online questionnaires. Face-to-face interviews with both students and lecturers are highly recommended as an online interview takes away the personal connection that was established with the participant prior to the interview. I think that a better relationship can be built upon or established by conducting interviews face-to-face. This would allow for greater in-depth engagement and therefore deeper understanding and richer data. However, having the option to do interviews online proved to be very useful during COVID-19 and should be considered as an alternative for any unplanned circumstances.

## **CHAPTER 9: REFLECTIONS ON MY RESEARCH JOURNEY**

In this last chapter, I reflect on my research journey in pursuing my Masters' degree. As per section 4.8 within my thesis, I explain the trustworthiness of my research. I continue to state in section 4.8.4 that the dependability and confirmability of my research are achieved through my audit trail (Appendix 3), Atlas.ti memos, paper memos, my role as the researcher (see Chapter 4, Section 4.2), and a personal reflection. In this chapter, I first elaborate on the importance of reflecting on my research journey as it is a vital part of qualitative research. I then share information regarding my research journey, along with the moments that influenced my research.

### **9.1. Reflexivity**

Multiple aspects impact the research process which can result in the researcher, myself, interpreting the results in a particular way. Reflexivity allows me to highlight any researcher bias that I may have during the research process (Carrim, 2012). Reflecting on my stance and perspective is important as qualitative research does not have set guidelines for presenting possible research bias (Carrim, 2012; Hammersley, 2008). Qualitative researchers rely on audit trails and memos to highlight and present moments that influenced the research process. By reflecting on my research journey, I can attempt to elaborate on, distinguish, and understand how specific aspects impacted the research process (Carrim, 2012; Nadin & Cassell, 2006). Through my reflection, I intend to provide insights into my personal academic experience, the role I have as the researcher and uncover potential biases.

### **9.2. My research background**

My academic journey started with an interest in animals. This led me to pursue a Diploma in Nature Conservation, which I registered for in 2014. My environmental attitudes and knowledge were similar to my participants in the sense that I chose to study nature conservation because I had a love and passion for it. Unlike other students who had some form of exposure to nature, I was one of the students who did not. Growing up, I never experienced the outdoors through camping or visiting national

parks. Instead, I was found at home, indoors, with the National Geographic channel, which was my only connection to nature at that time.

My motivation to study Nature Conservation started with having a love for animals and wanting to know more about them. I learned that, through a program such as Nature Conservation, I would be able to learn more about our wildlife and, as a bonus, I would learn more about our natural environment. Through my undergraduate years, I was also exposed to the ecology module offered by the NCP at NMU, George Campus. Just as with my research participants, my understanding of the natural environment shifted. Instead of only wanting to focus on animals and learn more about them, I became more interested in other aspects of the natural environment, especially in how the relationship between organisms, species, vegetation, and humans had a role in a healthy ecosystem.

My undergraduate years ended with a year of work-integrated learning in 2016 which, unfortunately, was not an ideal experience for me. I came to learn about the tourism industry and how it was coupled with nature conservation. Instead of being involved with the natural environment, as I came to expect after two years of learning about it, I had to entertain people and look after their personal needs. Of course, I was placed in a position to teach people about the natural environment. There were moments where it was quite impactful, but people were more interested in the entertainment value that they could obtain from spending a night or two on a private game lodge. I understand the value that the natural environment holds for leisure and relaxation activities, but this role did not satisfy me. I wanted to go beyond being a game guide or an entertainer.

I continued my academic journey by registering for my BTech/Honours' Degree in 2017. This course delved into the role that conservationists can have as managers and researchers. Taking up the role of an environmental manager would allow a student to get involved with actively protecting and managing the natural environment. The role of a researcher proceeds to investigate the natural environment through research questions and objectives, whether it be quantitative or qualitative.

Taking up the role of a researcher piqued my interest more at the time as I developed a liking toward the theoretical aspects of nature conservation. I also enjoyed the development process of research as students had one major research project to conduct that contributed 50% to our final evaluation marks for the degree. My research project for that year took on a quantitative approach.

I decided to continue with a Masters' degree after completing my BTech/Honours' degree in 2018. My research was going to focus on the water consumption rates of SNRM students within the AMP, FP, NCP, and Game Ranch Management program. The research planned to investigate the water consumption rates of on-campus SNRM residential students and how their teaching environment could contribute to more sustainable water practices. The research was going to make use of a weekly water meter consumption spreadsheet and a closed-ended questionnaire. Unfortunately, not everything went according to plan, and I had to readjust my research to instead look at first-year SNRM students' environmental attitudes and knowledge. My research officially commenced in 2019 with the new topic.

The direction my research took in 2019 was both exciting and daunting at the same time. Instead of my research being quantitative in nature, I had to now adapt to a qualitative approach. I had to undergo a whole paradigm shift as well as acquaint myself with new research tools, sampling approaches, analysis methods, writing techniques, and a narrative approach to research. Not only did I have to adapt from quantitative research to qualitative research, but I also had to incorporate a new discipline into my life.

My whole academic journey had been centered around natural sciences but, with the development of my masters' research, I had to discover, understand, and learn about education sciences. This was a discipline that I had no background knowledge in, and I had to go through many trials and errors with my thesis drafts before being able to effectively articulate and incorporate both disciplines in a complimentary way. This was not an easy feat and, if not for the help of my supervisors, Dr Angela Bianca Langtry Currie and Prof. Jennifer Anne Clarence-Fincham, my thesis would never have reached the standard that I am proud of today.

As a result, I have a newfound respect for interdisciplinary research and will strive to discover and understand how other disciplines are integrated with nature conservation. Nature conservation is a multidisciplinary field and opens itself to a multitude of opportunities within the research field.

### **9.3. Reflections of my masters' research journey.**

My masters' research journey began in July 2019 as I started with a pilot study. The pilot study helped me to prepare and then amend my research tools for my official research project which started in January 2020. Unfortunately, the pilot study could not prepare me for the events of COVID-19. I was fully prepared to conduct my questionnaires, semi-structured interviews, focus group interviews face-to-face before the pandemic struck. However, I was not prepared for the nationwide lockdown. I was able to conduct my baseline questionnaires and semi-structured interviews beforehand but had to adjust and amend my other tools for an online approach, which delayed my research. I felt defeated as this was not the first time that I had to adjust and amend my research.

Having to transition my tools to an online approach was not problematic. The ethical clearance process did, however, cause further delays to this research. Although necessary, the ethical procedures for social sciences can be tedious and time-consuming. I was frustrated by the fact that my research had to be halted because of having to go through such a process where I only had to make my research tools available online, which was not a big difficulty to do. I learned that as a researcher I should strive to be more adaptive in my research and try my best to work with delays. This will be a continuous learning development for me as I progress with my academic and research journey. I anticipate that, by strengthening these skills, I will learn to be more patient and flexible with uncertainty and delays that are experienced within research. After achieving ethical clearance for my amendments, I was able to proceed with my data gathering.

The data gathering proved to be a challenge as I did not consider how difficult it would be to encourage students to participate in an online questionnaire, especially considering the additional pressures the students were experiencing with the transition

to online learning. I was able to encourage some students to continue to participate in my research through group communication, personal communication, and additional appeals to them. With this, I was able to get an adequate number of students to participate in the post-intervention questionnaires. It did not, however, encourage them to want to participate in the online focus group sessions. Only two students showed curiosity in it. However, one eventually lost interest in participating in an online interview and did not communicate with me further. It is daunting to try to motivate students to participate in research that could contribute to their own academic journey. This made me realize that working with people, and students in particular, will not always be as straightforward as the research design intended.

As a researcher, I understand that we often take our participants for granted and often contribute to participation fatigue. In my opinion, the fatigue came from students having to take multiple surveys from the university asking students to provide their opinions and experiences on OTL. Multiple other researchers also took this opportunity to send out their own surveys for students to answer. I am not surprised that after all of this, apart from not having access to online resources, the first-year SNRM students did not want to continue participating in my research, especially concerning the rapid transition to OTL. This is something that both universities and researchers should keep in mind.

As researchers, we should work together in creating an easy and enabling environment for participation where our participants feel safe, unpressured, and valued. We should strive to prevent participation fatigue so that whoever works with the same sample population in the future does not have to experience similar challenges.

Despite the setbacks I experienced with taking my research online, I was still able to obtain data and complete my research for my Master's degree. Though I had to cut out and readjust a lot of the intended work, I was still able to provide an end product of which I am proud of. In essence, the project was about the research journey and gaining new skills that will aid me in the future. I was able to develop my organizational and communication skills through multiple changes and amendments to my research. I cultivated a new way of managing and undertaking my research, and, most

importantly, improved my problem-solving skills which allowed me to be more flexible with my planning.



## REFERENCES

Please note this reference list is based on the 7<sup>th</sup> edition of the APA.

- Al-Naqbi, A. K., & Alshannag, Q. (2018). The status of education for sustainable development and sustainability knowledge, attitudes, and behaviors of UAE University students. *International Journal of Sustainability in Higher Education*, 19(3), 566–588. <https://doi.org/10.1108/IJSHE-06-2017-0091>
- Amory, A., Gravett, S., & Westhuizen, D. van der. (2008). Teaching and learning at the University of Johannesburg: a position paper. [https://d1wqtxts1xzle7.cloudfront.net/30920972/Teaching\\_\\_Learning\\_at\\_UJ.pdf?1363072013=&response-content-disposition=inline%3B+filename%3DTeaching\\_and\\_learning\\_at\\_the\\_University.pdf&Expires=1624441047&Signature=En5FDhgMt6EuPkMyS6y7YOhkjE5i3GgGKOIThX4qvVrW](https://d1wqtxts1xzle7.cloudfront.net/30920972/Teaching__Learning_at_UJ.pdf?1363072013=&response-content-disposition=inline%3B+filename%3DTeaching_and_learning_at_the_University.pdf&Expires=1624441047&Signature=En5FDhgMt6EuPkMyS6y7YOhkjE5i3GgGKOIThX4qvVrW)
- Anney, V. N. (2014). Ensuring the quality of the findings of qualitative research: looking at trustworthiness criteria. *Journal of Emerging Trends in Educational Research and Policy Studies*, 5(2), 272–281. <https://doi.org/10.3109/08941939.2012.723954>
- Astin, A. W., Astin, H. S. H., & Lindholm, J. (2010). *Cultivating the spirit: how college can enhance students' inner lives*. (1st ed.). John Wiley & Sons.
- Atlas.ti (2021). *Atlas.ti 9 Windows Full Manual*. [https://doc.atlasti.com/ManualWin.v9/ATLAS.ti\\_ManualWin.v9.pdf](https://doc.atlasti.com/ManualWin.v9/ATLAS.ti_ManualWin.v9.pdf)
- Aucejo, E. M., French, J. F., Ugalde Araya, M. P., & Zafar, B. (2020). The impact of COVID-19 on student experiences and expectations: evidence from a survey. In *Journal of Public Economics* (Vol. 191).
- Balsiger, J., Förster, R., Mader, C., Nagel, U., Sironi, H., Wilhelm, S., & Zimmermann, A. B. (2017). Transformative learning and education for sustainable

development. *GAIA-Ecological Perspectives for Science and Society*, 26(4), 357–359. <https://doi.org/10.14512/gaia.26.4.15>

Biggs, H., Toit, D. Du, Etienne, M., Jones, N., Leitch, A., Lynam, T., Pollard, S., & Stone-Jovicich, S. (2008). A preliminary exploration of two approaches for documenting 'mental models' held by stakeholders in the Crocodile Catchment - South Africa. In *Water Research Commission*. <https://prodinra.inra.fr/record/30463>

Blackie, M. A. L., Case, J. M., & Jawitz, J. (2010). Student-centredness: the link between transforming students and transforming ourselves. *Teaching in Higher Education*, 15(6), 637–646. <https://doi.org/10.1080/13562517.2010.491910>

Boca, G. D., & Saraçlı, S. (2019). Environmental education and student's perception, for sustainability. *Sustainability*, 11(6), 1553. <https://doi.org/10.3390/su11061553>

Bui, Y. (2013). *How to write a master's thesis*. (2nd ed.). SAGE Publications.

Cambridge Dictionary. (2021). *Attitudes*. Cambridge Dictionary. <https://dictionary.cambridge.org/dictionary/english/attitude>

Carrim, N. (2012). "Who am I?"- South African Indian women managers' struggle for identity: escaping the ubiquitous cage. (Issue April). University of Pretoria.

Carter, R. L., & Simmons, B. (2010). The history and philosophy of environmental education. *The Inclusion of Environmental Education in Science Teacher Education*. Springer, Dordrecht., 3–16. <https://doi.org/10.1007/978-90-481-9222-9>

Chan, R. Y. (2016). Understanding the purpose of higher education: an analysis of the economic and social benefits for completing a college degree. *Journal of Education Policy, Planning, and Administration*, 6(5), 1–40.

Cohen, L., Manion, L., & Morrison, K. (2013). *Research methods in education*. (6th ed.). Routledge. [https://doi.org/10.1111/j.1467-8527.2007.00388\\_4.x](https://doi.org/10.1111/j.1467-8527.2007.00388_4.x)

- Conde, M. del C., & Samuel Sánchez, J. (2010). The school curriculum and environmental education: a school environmental audit experience. *International Journal of Environmental and Science Education*, 5(4), 477–494.
- COVID-19 South African Online Portal. (2020). About COVID-19 (Coronavirus). <https://sacoronavirus.co.za/information-about-the-virus-2/>
- Creswell, J. (2003). Research design: qualitative, quantitative, and mixed methods approaches. In *Research Design. Qualitative, Quantitative, and Mixed Methods Approaches*. (2nd ed.). Sage Publications. <https://doi.org/10.1017/CBO9781107415324.004>
- Creswell, J. W., & Plano, C. V. L. (2006). Choosing a mixed-method design. In *Designing and Conducting Mixed Methods Research* (1st ed., pp. 58–89). Sage Publications. <https://doi.org/1412927927>
- Creswell, JW, & Poth, C. (2016). *Qualitative inquiry and research design: choosing among five approaches*. (2nd ed.). Sage Publications.
- De Lange, A. M. (2004). An evaluation of the implementation of the school environmental policy and management plan” in schools in Mpumalanga.
- Dean of Natural Resource Science and Management. (2020). Demographic information on SNRM programs.
- Deenanath, G. (2004). Effective implementation of school environmental education policies in a school district in Gauteng. <http://uir.unisa.ac.za/bitstream/handle/10500/1888/01dissertation.pdf?sequence=2>
- Department of Education. (1995). White paper on education and training. In Cape Town: Government Press. Department of Education. [https://www.education.gov.za/Portals/0/Documents/Legislation/White paper/White paper on Education and Training 1995.pdf?ver=2008-03-05-111656-000](https://www.education.gov.za/Portals/0/Documents/Legislation/White%20paper/White%20paper%20on%20Education%20and%20Training%201995.pdf?ver=2008-03-05-111656-000)

- Department of Environmental Affairs and Tourism. (2001). A strategic framework for environmental education In South Africa. In Pretoria. <https://www.capetown.gov.za/en/CityHealth/Documentation/Documents/Regulations - Prohibition of the Use, Manufact, I'm and Export of Asbestos and Asbestos Containing Materials - R 341 of 2008.pdf>
- Dillon, J., Morris, M., O'Donnell, L., Reid, A., Rickinson, M., & Scott, W. (2005). Engaging and learning with the outdoors: the final report of the outdoor classroom in a rural context action research project.
- Dumford, A. D., & Miller, A. L. (2018). Online learning in higher education: exploring advantages and disadvantages for engagement. *Journal of Computing in Higher Education*, 30(3), 452–465. <https://doi.org/10.1007/s12528-018-9179-z>
- Elo, S., & Kyngäs, H. (2008). The qualitative content analysis process. *Journal of Advanced Nursing*, 62(1), 107–115. <https://doi.org/10.1111/j.1365-2648.2007.04569.x>
- Eneji, C.-V. O., Akpo, D. M., & Etim, E. A. (2017). Historical groundwork for environmental education (fundamentals and foundation of environmental education). *International Journal of Continuing Education and Development Studies*, 3(1), 110–123.
- Ensor, L. (2020). Universities and colleges to remain closed under COVID-19 level 4 lockdown. *BusinessDay*. <https://www.businesslive.co.za/bd/national/education/2020-04-30-universities-and-colleges-to-remain-closed-under-COVID-19-level-4-lockdown/>
- Environmental Education Association of Southern Africa. (2017). History of EEASA. <https://eeasa.org.za/home/about-us/history-of-eeasa/>
- European Centre for Disease Prevention and Control. (2020). Event background COVID-19. <https://www.ecdc.europa.eu/en/novel-coronavirus/event-background-2019>

- Gallup, L. F. (2014). The 2013 Lumina study of the American public's opinion on higher education and U.S. business leaders poll on higher education. What America Needs to Know About Higher Education. <https://www.luminafoundation.org/files/resources/2013-gallup-lumina-foundation-report.pdf>
- Gill, D. (2015). A constructivist lens for professional learning. *The Morning Watch: Educational and Social Analysis*, 42(3–4).
- Given, L. M. (2008). The sage encyclopedia of qualitative research methods. In L. M. Given (Ed.), *Sage Publication* (1st ed.). Sage Publications, Inc. <https://doi.org/10.4135/9781412963909>
- Gonzalez, T., de la Rubia, M., Hincz, K., Comas-Lopez, M., Subirats, L., Fort, S., & Sacha, G. M. (2020). Influence of COVID-19 confinement on students performance in higher education. *PloS One*, 15(10), 1–25. <http://arxiv.org/abs/2004.09545>
- Hammersley, M. (2008). Reflexivity for what? A response to Gewirtz and Cribb on the role of values in the sociology of education. *British Journal of Sociology of Education*, 29(5), 549–558. <https://doi.org/10.1080/01425690802263718>
- Hastings, S., & Salkind, N. (2012). Triangulation. In *Encyclopedia of Research Design* (pp. 1538–1540). SAGE Publications. <https://doi.org/10.4135/9781412961288>
- Hatton MacDonald, D., Bark, R., MacRae, A., Kalivas, T., Grandgirard, A., & Strathearn, S. (2013). An interview methodology for exploring the values that community leaders assign to multiple-use landscapes. *Ecology and Society*, 18(1). <https://doi.org/10.5751/ES-05191-180129>
- Hsieh, H. F., & Shannon, S. E. (2005). Three approaches to qualitative content analysis. *Qualitative Health Research*, 15(9), 1277–1288. <https://doi.org/10.1177/1049732305276687>

International Bureau of Education. (2016) Multidisciplinary approach. UNESCO  
<http://www.ibe.unesco.org/en/glossary-curriculum-terminology/m/multidisciplinary-approach>

Jeong, H. C., & So, W. Y. (2020). Difficulties of online physical education classes in middle and high school and an efficient operation plan to address them. *International Journal of Environmental Research and Public Health*, 17(19), 7279. <https://doi.org/10.3390/ijerph17197279>

Joy, P., & Philip, N. (2003). Handbook of environmental education. In *The handbook of environmental education* (1st ed.). Routledge.  
<https://doi.org/10.2307/3120486>

Largo-Wight, E., Guardino, C., Wludyka, P. S., Hall, K. W., Wight, J. T., & Merten, J. W. (2018). Nature contact at school: the impact of an outdoor classroom on children's well-being. *International Journal of Environmental Health Research*, 28(6), 653–666. <https://doi.org/10.1080/09603123.2018.1502415>

Le Grange, L. (2002). Towards a language of probability for sustainability education in (South) Africa. *South African Journal of Education* Copyright, 22(2), 83–87.  
[https://doi.org/10.1163/9789087906153\\_017](https://doi.org/10.1163/9789087906153_017)

Lincoln, Y. S. Y. S., Denzin, N. K., & S, Y. (2005). The SAGE handbook of qualitative research. In *The SAGE Handbook of Qualitative Research*. (3rd ed.). Sage Publications. <https://doi.org/10.1017/CBO9781107415324.004>

Makokotlela, M. V. (2016). Determining the effectiveness of environmental education initiatives of selected government departments in South Africa. [University of South Africa].  
<https://www.infodesign.org.br/infodesign/article/view/355%0Ahttp://www.abergo.org.br/revista/index.php/ae/article/view/731%0Ahttp://www.abergo.org.br/revista/index.php/ae/article/view/269%0Ahttp://www.abergo.org.br/revista/index.php/ae/article/view/106>

- Mardiana, H. (2020). Lecturers' adaptability To technological change and its impact on the teaching process. *JPI (Jurnal Pendidikan Indonesia)*, 9(2), 275–289. <https://doi.org/10.23887/jpi-undiksha.v9i2.24595>
- Marques, R., & Xavier, C. R. (2020). The challenges and difficulties of teachers in the insertion and practice of environmental education in the school curriculum. *International Journal on Social and Education Sciences*, 2(1), 49–56.
- Mathiba, G. (2020). COVID-19 and South African universities: a raft of problems to ponder. *Daily Maverick*. <https://www.dailymaverick.co.za/opinionista/2020-04-09-COVID-19-and-south-african-universities-a-raft-of-problems-to-ponder/>
- McCrea, E. J. (2006). The roots of environmental education: how the past supports the future. In *Environmental Education and Training Partnership (EETAP)*. [http://cms.eetap.org/repository/moderncms\\_documents/History.Final.20060315.1.1.pdf](http://cms.eetap.org/repository/moderncms_documents/History.Final.20060315.1.1.pdf)
- Merriman Webster. (2018) Definition of ecology. *Merriman Webster Dictionary* <https://www.merriam-webster.com/dictionary/ecology>
- Moolde. (2004). About Moodle. <https://moodle.com/about/>
- Nadin, S., & Cassell, C. (2006). The use of a research diary as a tool for reflexive practice: Some reflections from management research. *Qualitative Research in Accounting & Management*, 3(3), 208–217. <https://doi.org/10.1108/11766090610705407>
- National Environmental Policy Act. (1969). The National Environmental Policy Act of 1969. <https://www.energy.gov/nepa/downloads/national-environmental-policy-act-1969>
- National Institute for Communicable Diseases. (2020). First case of COVID-19 coronavirus reported in SA. <https://www.nicd.ac.za/first-case-of-COVID-19-coronavirus-reported-in-sa/>

Nelson Mandela University (NMU) - School of Natural Resource Management (SNRM). (2005a). Agricultural Management. <https://snrm.mandela.ac.za/Agricultural-Management>

Nelson Mandela University (NMU) - School of Natural Resource Management (SNRM) (2005b). Forestry. <https://snrm.mandela.ac.za/Forestry>

Nelson Mandela University (NMU) - School of Natural Resource Management (SNRM). (2009). Nature Conservation. <https://snrm.mandela.ac.za/Nature-Conservation>

Nelson Mandela University (NMU). (2013). Qualification details: Agriculture Management. <https://www.mandela.ac.za/academic/Courses-on-offer/Qualification-Details.aspx?appqual=%252bA&qual=2065&faculty=1200&ot=02&cid=5>

Nelson Mandela University (NMU). (2018a). Module outline: Animal Production I. <https://www.mandela.ac.za/Academic/Courses-on-offer/Module-Details.aspx?appqual=%2BA&qualcode=2065&faculty=1200&modulecode=SA1001&deliverymethod=02&cid=5>

Nelson Mandela University (NMU). (2018b). Module outline: Conservation ecology. <https://www.mandela.ac.za/Academic/Courses-on-offer/Module-Details.aspx?appqual=%2BH&qualcode=2222&faculty=1200&modulecode=NCE1121&deliverymethod=02&cid=88>

Nelson Mandela University (NMU). (2018c). Module outline: Forest ecology I. <https://www.mandela.ac.za/Academic/Courses-on-offer/Module-Details.aspx?appqual=%2BE&qualcode=2905&faculty=1200&modulecode=FCN1001&deliverymethod=02&cid=49>

Nelson Mandela University (NMU). (2018d). Qualification details: Forestry. <https://www.mandela.ac.za/academic/Courses-on-offer/Qualification-Details.aspx?appqual=%252bE&qual=2905&faculty=1200&ot=02&cid=49>



- Nelson Mandela University (NMU). (2018e). Qualification details: Nature Conservation. <https://www.mandela.ac.za/academic/Courses-on-offer/Qualification-Details.aspx?appqual=%252bH&qual=2222&faculty=1200&ot=02&cid=88>
- Nelson Mandela University (NMU). (2020). Completing 2020 academic year: students. <https://www.mandela.ac.za/News-and-Events/Coronavirus-Information/Academic-Research-Activities-during-COVID-19/Completing-2020-academic-year-Students>
- Newing, H. (2010). *Conducting research in conservation: social science methods and practice*. Routledge. <https://doi.org/10.4324/9780203846452>
- Noddings, N. (2018). *Philosophy of education*. (4th ed.). Routledge.
- Norhaidah, S., & Idros, S. (2006). Exploring environmental behaviours, attitudes, and knowledge among university students: positioning the concept of sustainable development within Malaysian education. *Journal of Science and Mathematics Education in Southeast Asia*, 29(1), 79.
- ONGO. (2006). Agenda 21. Chapter 36. Promoting education, public awareness, and training. UN Documents Cooperation Circles Gathering a Body of Global Agreements. <http://un-documents.net/a21-36.htm>
- Onwuegbuzie, A., & Collins, K. (2007). A typology of mixed methods sampling designs in social science research. *Qualitative Report*, 12(2), 281–316. <https://doi.org/10.1007/s11135-006-9000-3>
- Phellas, C. N., Bloch, A., & Seale, C. (2011). Structured methods: interviews, questionnaires, and observation. *Researching Society and Culture*, 3, 182–205.
- Pragholapati, A. (2020). COVID-19 impact on students.
- Rahi, S. (2017). Research design and methods: a systematic review of research paradigms, sampling issues, and instruments development. *International*

Journal of Economics & Management Sciences, 6(2), 1–5.  
<https://doi.org/10.4172/2162-6359.1000403>

Ramadhan, S., Sukma, E., & Indriyani, V. (2019). Environmental education and disaster mitigation through language learning. *IOP Conference Series: Earth and Environmental Science*, 314(1), 012054. <https://doi.org/10.1088/1755-1315/314/1/012054>

Republic of South Africa. (1997). Water Services Act of 1977. In *RSA Government Gazette* (Vol. 390). [http://www.saflii.org/za/legis/num\\_act/wsa1997175.pdf](http://www.saflii.org/za/legis/num_act/wsa1997175.pdf)

Republic of South Africa. (1998a). Marine Resources Act of 1998. In *RSA Government Gazette* (Vol. 395).

Republic of South Africa. (1998b). National Environmental Management Act of 1998. In *RSA Government Gazette* (Vol. 401). [https://www.environment.gov.za/sites/default/files/legislations/nema\\_amendment\\_act107.pdf](https://www.environment.gov.za/sites/default/files/legislations/nema_amendment_act107.pdf)

Republic of South Africa. (2004a). National Environment Management: Air Quality Act of 2004. In *RSA Government Gazette* (Vol. 476). [http://www.nsw.gov.au/sites/default/files/Government\\_Gazette\\_2\\_December.pdf#page=15](http://www.nsw.gov.au/sites/default/files/Government_Gazette_2_December.pdf#page=15)

Republic of South Africa. (2004b). National Environmental Management: Biodiversity Act of 2004. In *RSA Government Gazette* (Vol. 467). <http://ship.mrc.ac.za/biodiversity.pdf>

Republic of South Africa. (2006). Electricity Regulation Act of 2006. In *RSA Government Gazette* (Vol. 493). [https://www.gov.za/sites/default/files/gcis\\_document/201409/a4-060.pdf](https://www.gov.za/sites/default/files/gcis_document/201409/a4-060.pdf)

Republic of South Africa. (2013). National Environmental Management: Waste Management Act of 2008. In *RSA Government Gazette* (Vol. 69). [www.gpwonline.co.za](http://www.gpwonline.co.za)

- Sandelowski, M. (2000). Combining qualitative and quantitative sampling, data collection, and analysis techniques in mixed-method studies. *Research in Nursing & Health*, 23(3), 246–255. [https://doi.org/10.1002/1098-240X\(200006\)23:3<246::AID-NUR9>3.0.CO;2-H](https://doi.org/10.1002/1098-240X(200006)23:3<246::AID-NUR9>3.0.CO;2-H)
- Schuch, I. H., & Henriksen, C. B. (2013). Opinions and knowledge about climate change science in high school students. *Ambio*, 42(6), 755–766. <https://doi.org/10.1007/s13280-013-0388-4>
- Scott, E. (2020). How to handle the stress of working from home. *Verywellmind*. <https://www.verywellmind.com/the-stress-of-working-from-home-4141174>
- Searle, S., & Bryant, C. (2009). Why students choose to study for a forestry degree and implications for the forestry profession. *Australian Forestry*, 72(2), 71–79. <https://doi.org/10.1080/00049158.2009.10676292>
- Singh, P. D. (2017). *Education: an essential tool for sustainable development*. H.N.B.Garhwal University.
- The Glossary of Education Reform. (2015). Scaffolding. <https://www.edglossary.org/scaffolding/>
- Tovar-Gálvez, J. C. (2021). Bringing environmental education to the curriculum: Practical elements emergent from teaching experiences and research. *Interdisciplinary Journal of Environmental and Science Education*, 17, e2236. <https://doi.org/10.21601/ijese/9606>
- Turner, D. W. (2010). Qualitative interview design: a practical guide for novice investigators. *The Qualitative Report*, 15(3), 754.
- United Nations Educational Scientific and Cultural Organization. (1948). *Proceedings of the conference for the establishment of the International Union for the Protection of Nature*. <https://en.unesco.org/courier/july-1948>
- United Nations Educational Scientific and Cultural Organization. (1975). *The Belgrade Charter: a framework for environmental education*. <https://unesdoc.unesco.org/ark:/48223/pf0000017772>

United Nations Educational Scientific and Cultural Organization. (1977). Tbilisi Declaration. <https://unesdoc.unesco.org/ark:/48223/pf0000032763>

United Nations Environment Programme. (1972). Stockholm declaration on the human environment. United Nations Conference on the Human Environment, Stockholm, Sweden, 1972. New York: United Nations Environment Programme.

United States. (1978). National commission for the protection of human subjects of biomedical, and behavioral research. In *The Belmont report: ethical principles and guidelines for the protection of human subjects of research* (Vol. 2). The Commission.

Van der Merwe, P. D., Parekh, P. A., Gravett, P. S., Ryan, P. R., Kadt, P. E. De, Spowart, P. J., & Smit, R. (2007). *UJ teaching and learning strategy*. University of Johannesburg.

Verawardina, U., Asnur, L., Lubis, A. L., & Hendriyani, Y. (2020). Reviewing online learning facing the COVID-19 outbreak. *Talent Development and Excellence*, 12, 385–392.

Wallen, B. M., Sheehan, N., Plante, L., Martinez, E., & Starke, J. A. (2019). Long-term impact on environmental attitudes and knowledge assessed over three semesters of an environmental engineering sequence. In *American Society for Engineering Education. 2019 ASEE Annual Conference and Exposition*.

## Appendix 1: Baseline Questionnaire

### BASELINE QUESTIONNAIRE SECTION

The purpose of this exercise is to obtain your attitudes and knowledge about ecological concepts as well as obtain your opinions about a specific program and module. Your participation is completely voluntary. You may withdraw from this questionnaire at any time. Your contributions will be handled confidentially, and your anonymity protected at all times. The data obtained from this questionnaire will be used for academic purposes only and might be used in longitudinal or comparative studies in the future.

#### GENERAL QUESTIONS

Are you over the age of 18? (If no, please do not resume with the questionnaire)

Yes	No
-----	----

What is your gender?

Female	Male	Other
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What type of environment do you come from?

Rural	Semi-rural	Urban	Farm
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#### BASELINE UNIVERSITY QUESTIONS

Which program are you enrolled in? (*tick the appropriate box*):

Agricultural Management	Forestry	Wood Technology	Game Ranch Management	Nature Conservation
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What year of study are you currently in? (*tick the appropriate box*):

1st	2nd	3rd
-----	-----	-----

What semester are you currently in? (*tick the appropriate box*)

1st	2nd
-----	-----

## Appendix 1: Baseline Questionnaire

Are you repeating any modules? (*tick the appropriate box*)

Yes	No
-----	----

### REFLECTIVE QUESTIONS SECTION

What do you know about (Agricultural Management, Forestry, Nature Conservation)?

Why did you choose to study (Agriculture Management, Forestry, Nature Conservation)?

What would you like to learn from (Agriculture Management, Forestry, Nature Conservation)?

## Appendix 2: Post-intervention Questionnaire

### POST-INTERVENTION QUESTIONNAIRE SECTION

The purpose of this exercise is to obtain your attitudes and knowledge about ecological concepts as well as obtain your opinions about a specific program and module. Your participation is completely voluntary. You may withdraw from this questionnaire at any time. Your contributions will be handled confidentially, and your anonymity protected at all times. The data obtained from this questionnaire will be used for academic purposes only and might be used in longitudinal or comparative studies in the future.

#### GENERAL QUESTIONS

Are you over the age of 18? (If no, please do not resume with the questionnaire)

Yes	No
-----	----

1. What is your gender?

Female	Male	Other
--------	------	-------

2. What type of environment do you come from?

Rural	Semi-rural	Urban	Farm
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#### BASELINE UNIVERSITY QUESTIONS

1. Which program are you enrolled in (*tick the appropriate box*):

Agricultural Management	Forestry	Wood Technology	Game Ranch Management	Nature Conservation
-------------------------	----------	-----------------	-----------------------	---------------------

2. What year of study are you currently in? (*tick the appropriate box*):

1st	2nd	3rd
-----	-----	-----

3. What semester are you currently in? (*tick the appropriate box*)

1st	2nd
-----	-----

## Appendix 2: Post-intervention Questionnaire

4. Are you repeating any modules? (*tick the appropriate box*)

Yes	No
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### REFLECTIVE QUESTIONS SECTION

What have you learned about in (Animal Production I, Forest Ecology I, Conservation Ecology I) specifically?

What did (Animals Production I, Forest Ecology I, Conservation Ecology I) teach you about natural resources?

How have your views on natural resources changed after the (*Animals Production I, Forest Ecology I, Conservation Ecology I*) module?

Please rate the possible factors that might have influenced how you feel about (*Agricultural Management, Forestry, Nature Conservation*).

Factor	Very Low Impact	Low Impact	Average Impact	High Impact	Very High Impact
(Animal Production I, Forest Ecology I, Conservation Ecology I)	1	2	3	4	5
Other modules	1	2	3	4	5
Classmates	1	2	3	4	5
Classroom Environment	1	2	3	4	5
Family	1	2	3	4	5
Friends	1	2	3	4	5
Lecturer	1	2	3	4	5
Specific modules	1	2	3	4	5
Students in different programs	1	2	3	4	5
Other influencing factors: <i>Please Specify</i>	Very Low Impact	Low Impact	Average Impact	High Impact	Very High Impact



## Appendix 2: Post-intervention Questionnaire

	1	2	3	4	5
	1	2	3	4	5
	1	2	3	4	5

How do you feel about the online teaching and learning approach that the University has adopted in light of the COVID-19 pandemic?

How have you managed with the transition to online teaching and learning?

How has online teaching and learning changed the way you learn for (Animals Production I, Forest Ecology I, Conservation Ecology I)?

Please explain how COVID – 19 has affected your studies whether it be positive and/or negative.

### Appendix 3: Audit Trail – Research Timeline and Schedules

Research Timeline		
Date	Action	Additional Comments
01 Jul 2019	Pilot study	Game Ranch Management senior students sample population.
15 Jul 2019	Pilot study content analysis	Inductive coding, the grouping of codes, and data analysis.
10 Aug 2019	Research tools amendments	Shift to the first-year SNRM sample population.
14 Dec 2019	Human Ethics approval	Sampling of first-year Agriculture, Forestry, and Nature Conservation students, face-to-face.
03 Jan 2020	Interview with Lecturer 1 and 3.	Face-to-face interview.
06 Jan 2020	Interview with Lecturer 2.	Face-to-face interview.
25 Jan 2020	Research introduction to students.	Face-to-face introduction.
27 Jan 2020	Baseline questionnaire sampling.	Face-to-face sampling.
03 Feb 2020	Follow-up sampling for Agriculture students.	Face-to-face sampling.
04 Feb 2020	Follow-up sampling for Forestry students.	Face-to-face sampling.
06 Feb 2020	Follow-up sampling for Nature Conservation students.	Face-to-face sampling.
10 Feb 2020	Transcription of data into Atlas.ti.	Questionnaires and interviews.
17 Feb 2020	Content analysis.	Inductive coding, the grouping of codes, and data analysis.
09 March	Baseline results write up.	Drafts 1 – 5.
01 Jun 2020	Amendments to research due to COVID – 19.	Transition to online sampling.
25 Jun 2020	Human Ethics approval for amended research.	Sampling of first-year Agriculture, Forestry, and Nature Conservation students, online.
17 Jul 2020	A follow-up interview with the Lecturer 3.	Online interview.
28 Jul 2020	A follow-up interview with the Lecturer 1.	Online interview.
29 Jul 2020	A follow-up interview with the Lecturer 2 lecturer.	Online interview.

### Appendix 3: Audit Trail – Research Timeline and Schedules

01 Sept 2020	Research reintroduction and post-intervention questionnaire distribution.	Online sampling.
28 Sept 2020	Transcription of data into Atlas.ti.	Questionnaires and interviews.
01 Oct 2020	Contact students who were interested in participating in an online interview session.	Preparation for online focus-group sessions.
05 Oct 2020	Content analysis.	Inductive coding, the grouping of codes, and data analysis.
26 Oct 2020	Post-intervention results write up.	Drafts 1 – 3.

**Project: Baseline Questionnaire**

Report created by Eileen Jooste on 03/09/2020.

**Memo Report**



Students Baseline Attitudes and Knowledge

02/11/2020

Codes of interest include: Concern for future generations, expectations, positive & negative feelings, interest (animals, plants, environment), unusual terms, what I would like to learn, why I chose to study.

Possible categories and one-word summaries for some of the codes: Sustaining vs Conserving, maintaining vs Preserving, protecting vs Prevent extinction, and Managing -> All can be grouped into either Conserving, Maintaining, Protecting, Managing -> The three main groups will be Conserving, Maintaining, Managing.

After reviewing previous statements, two main groupings will be used for the above codes -> Conserving and Managing.

02/13/2020

Grouping the codes will consist of the following categories: What is and Why I chose.

What is = Conserving and Managing

Why I chose = Nature Lover, Protect Future, Improvement of knowledge.

02/14/2020

Reconsider grouping. Instead of Managing and Work -> Concepts of the program.

Why I chose grouping has been condensed -> Knowledge, Job opportunity, Experience, Contribution.

What is = Concepts of the program

Why I chose = Knowledge, Job opportunity, Experience, Contributing.

02/17/2020

As I go through the coding process, I have realized that the first-year SNRM students all have their own definition towards the natural environment.

Agri = Farming with animals and plants.

Forestry = Plantations and Commercial Forests

Nat Cons = Trees, Water, Animals, Plants.

I was confused with the definition at first as I have my own personal definition which corresponds with the nature conservation students. I now understand that it differs between the groups.

02/24/2020

## Appendix 3: Audit Trail – Atlas.ti Memos

A fresh look at my codes and analysis thus far made me realize that I was stuck with my codes. I scrapped it all and started over.

Emerging codes so far = Connection, Feelings, Opinions, Contribution, improving knowledge, owning a business, Working for Industry, Association, Concerns, Experience, understanding vs Not Understanding.

02/26/2020

Code groups consist of: Attitudes and Knowledge.

Code groups have been further broken down.

Attitudes = Feelings, Opinions, Thoughts.

Knowledge = Association, Concerns, Experiences, Understanding.

02/27/2020

### **Final thoughts.**

Baseline attitudes and knowledge consist out of student's opinions about nature, their programs, and industry.

Students express concern for nature, the future, society, and the economy.

Students want to contribute to nature, the future, society, and the economy.

Students want to improve on their knowledge and nature concepts.

## **Project: Semi-structured Interviews**

Report created by Eileen on 03/09/2020.

### **Memo Report**



Semi-structured Interview

02/18/2020

Codes so far: Materials and Methods, Teaching approach, Limitations, Contributions, Differing approaches, Views.

Possible groupings include: Materials and Methods, Teaching Approach.

02/21/2020

Codes have been broken down more.

Materials = Journal Articles, Note Packs, Study Guides, Presentations, Videos.

Methods = Spot Checks, Assignments, Tests, Excursions, Teamwork.

Teaching approach = Applied, African examples, Current examples, Same level, Limitations, Contributions, Different, Views.

02/25/2020

The teaching approach and Views have been broken down further.

TA Contributions = Interest change, Knowledge and Understanding, Prepare for Career.

## Appendix 3: Audit Trail – Atlast.ti Memos

TA Limitations = Class size, Methods, Time, Workload.

TA Different = Multidisciplinary, Not the same, Same.

Views = Backgrounds, Changes, Differs Emotional, Lack of courage, Relationship.

New groupings -> Materials and Methods, Teaching Approach, and Views on first-year SNRM students.

02/28/2020

### **Final thoughts.**

All three lecturers make use of similar materials and methods except when it comes to: Journals, Note Packs, Study Guides, Spot Checks, and Teamwork.

They also take on similar teaching approaches and how they would like to contribute to the students' success.

They experience limitations, which differ from each other: Methods, Time, Class size, Funding.

They all share different views on their students, especially when it comes to African students.

## **Project: Follow-up Semi-structured Interviews**

Report created by Eileen on 10/26/2020.

### **Memo Report**



Follow-up Interview

09/29/2020

Codes so far: Assessments, Benefits, Challenge, Teaching approach.

Possible groupings: Transition to Online teaching and learning.

09/28/2020

Assessments and Teaching approach have been broken down into more codes.

Assessments = Challenging, Quizzes, Reflective essays, Worksheets.

Teaching approach = Adapted, Frustrating, has not changed, contact sessions, video based.

New materials and methods = Moodle and Teams.

09/30/2020

A few benefits were identified, and the code has been broken up.

Benefit Lecturer = Reusable material, technology, work from home.

Benefit Student = Access to resources, Cost Saving, Online Skills, Own Pace, Stress relief.

10/05/2020

More challenges were identified as the coding progressed. The code was broken up.

Challenge Lecturer = Balancing work and life, contact sessions, practical teaching, other duties, student communication, time-consuming, university communication.

## Appendix 3: Audit Trail – Atlast.ti Memos

Challenge Student = Lack of practical knowledge, online access, overcomplicated, pushed to transition, time management, workload.

10/09/2020

### **Final thoughts**

The environmental lecturers all had to adapt their teaching approaches. New materials, methods, and assignment strategies were identified namely: Online worksheets, Quizzes, Reflective essays, and the use of Moodle and Teams.

The environmental lecturers all faced challenges with online teaching.

Only the Forestry and Nature Con lecturer was able to see the benefits of online teaching.

### **Project: Post-intervention Questionnaires**

Report created by Eileen on 10/26/2020.

### **Memo Report**



Post Attitudes and Knowledge

10/12/2020

Codes so far: Changed Views, Influences, Learned so far, Online teaching and learning.

10/15/2020

Broken down codes.

Changed Views = Environment, Industry.

Influences = According to Table.

Learned = Program Concepts, Gained Knowledge.

Online teaching and learning = Benefits and Challenges

Because the influences were rated in a table, I have to consider how I will be coding the most significant influence for each individual.

The criteria so far are to code all influences marked on the table.

10/16/2020

The most significant influence would be a rating from Average to Very High impact. The rest of the scoring is from Low to very low, meaning that those influences had little to no impact on the student.

Criteria for coding the influences that had an impact on the students = Average to Very High impact

Additional impacts that have been mentioned by the students = Love for Nature and Community.

10/21/2020

The following codes were broken down further: Online teaching and learning and Learned.

## Appendix 3: Audit Trail – Atlast.ti Memos

Online teaching and learning Benefits = Adapting, continue studies, good communication, learning changed, more time, online skills, prefer online.

Online teaching and learning Challenges = Bad communication, barriers to resources, difficult, hard, lack of knowledge, learning did not change, practicals reduced, prefer face-to-face, time, views of uni.

Learned = Changed perspectives, Agri-, Forest-, and NatCon concepts.

10/23/2020

The rating of influences indicates that the following categories had the highest impact on the students: Classmates, Classroom environment, Ecology Module, Lecturer, other program modules, other students in other programs.

The second-highest ratings include: Family, Friends, Community.

The "lowest" ratings were for: Job opportunities, Love for Nature, Social Media.

New code groups for influences are = Classroom environment, Personal, and others.

10/26/2020

### **Final thoughts.**

There have been changes to students' perspectives in terms of nature, industry, and their module.

The classroom environment had the highest impact on these changes.

The online experience for the students seemed to be challenging, though there were some positives associated with it.



Data collection

27 January 2020 → All students

- Entered venue @ 10:00 → Academic Writing
- Informed students of research
- Asked Carrie K., Velise, Woodhock to leave venue
- Asked under 18 to leave venue
- Asked students to group into N, F, A
- Distributed questionnaires
- Students took 5-15 mins, exception of 25 mins

inform me that some Agra students were giving her trouble. A group of students refused to participate in her class activities and were classified as racist towards other students. They were disrespectful to both Sham and other students. After Sham's session some of the students got upset to talk with her. notes that there is hope for those students who came to her, but the rest will not make it far.

03 February 2020 - Agra 73 participants

- Entered venue @ 10:00 → class
- Informed students of research
- Asked students who filled in to leave
- Students took 15 min to fill in

did give a brief intro to who I am and what I do. He mentioned that he told students who are expecting to also leave along with students who already filled in the questionnaire. Only one student handed in an un-filled paper. I will see if there are any unanswered questionnaires as I analyse the data.

Total students/participants: 39

04 February 2020 - Forestry 24 participants

- Entered venue @ 01:45 → Class
- Informed students of my research
- Asked students who have filled out to leave
- Students took 20 min to fill in

gave a quick intro as to who I am. He expressed the importance of the students contribution to my study. He mentioned that it was voluntary.

The class did have a brief session with the SRC to choose a rep for the class. This did get the students in a relaxed state as they were choosing students to be rep for the year.

06 February 2020 - Nat Course 6 participants

- Entered venue @ 11:25 → class
- Informed students of research
- Asked students who have filled out to leave
- Students took 20 min to fill in

gave a quick intro to who I am. He encouraged students to participate but did mention that the game numbers will not be asked to participate.

I asked the game numbers and students who have filled in the questionnaire to exit the venue. A group of students were left behind after telling that only 18 year olds may fill in the questionnaire, more students left. Only 6 students remained. I found it quite disappointing especially after my successful encounters with apt. Forest. However, the 6 students did appear to be willing and did take their time to answer the questions to the best of their capabilities!

03 February 2020 - Interview

- o Entered venue @ 14:30
- o Introductory study
- o Consent form
- o Recording

was quite descriptive when answering the questions. As he is quite a new lecturer he appears to be very passionate about teaching students. From what I can tell his teaching approach is unique and differs greatly from the other lecturers --- so far!

1.) mentioned that his teaching approach varies as the classes progress. At first, in the intro class, he would assess where the students stand. He knows they are new and starts off with a clean slate. He is also aware of the various backgrounds that students come from which has an impact on how he approaches his classes.

He introduces the students to various learning concepts. He is aware that some students may know these concepts.

His general approach as classes progress is interactive, visual and practical.

2.) uses the following methods when teaching: Visual, Seminars, examples (practical), Practical occurrences, Applied approach.

He engages his students with the content and does not just read lecture the slides.

3.) mentioned that his teaching approach differs from the way he was taught. It is very practical and applied. He encourages his students to think beyond the given content.

Interview - Cont.

4.) mentioned that he noticed that first year students have a lot of emotions as they enter their first year - It is higher than what they experience in school level of education.

It takes time for the students to grasp concepts in the beginning but at the end they are able to understand more.

It is in the 2nd semester that the students show more maturity and confidence in the classroom env.

noted that Life Skills taught in schools has an influence on how the students enter Uni. If more time was invested in Life Skills by schools students might be better adapted for the steps towards higher levels of education.

5.) expressed that his classes change students very significantly. He aims to increase the confidence and aspiration of students to become farmers as it is the main enterprise that most farmers aspire to.

Though there is not a clear way to see how knowledge changes among students, did say that he will be providing the students with standardised testing to evaluate and assess where students stand. This will encourage students to pay attention and help the quiet students who do not participate in verbal activities. - I feel this is how approach to teaching differs a lot from other lecturers.

I asked the same additional question as I did with :

6.) noted that diff. backgrounds have an influence on their experience. Exposure to education has an influence. Each student have their own pace. Students are quiet and reserved at first.

### Appendix 3: Audit Trail – Paper Memos

03 February 2020 Interview - [redacted]

- o Informed about my study
- o Provided Consent Form
- o Recorded session

Following notes were taken:

- 1) [redacted] starts the module with bringing everyone to the same level. Afterwards he starts to introduce more complex concepts.
- 2) [redacted] uses presentations and notepaper. Presentations consist of photos, words, explanations of the photos. Complex theories are usually presented with heavy text, graphs, videos, journal articles.
- 3) [redacted] explained that he makes sure to cover multiple subjects when talking about his module. He tries to make it multi-disciplinary and tries to include everything.

a) [redacted] describes the students as being terrified at first and unsure about the teaching. As the semester progresses they become more relaxed.

s) [redacted] explains that his class develops the interest of students towards different things. Expanding their interests to insects and plants rather than focussing on just mammals.

I asked an additional question about if there is anything that [redacted] wants to add which he thinks is important to note with regards to the classroom environment.

06 February 2020 - [redacted] Interview

- o Entered venue @ 13:20
- o Introduced study
- o Consent Form
- o Recording

[redacted] forgot about the interview, which prevented us from starting on time. [redacted] did talk a lot and didn't stray away from the questions that was asked, but their provide useful insights about lectures in general.

1) [redacted] mentioned that there is the way he would like to teach and that there is a way in which it is really done.

He mentioned that he takes a practical approach and tries to find ways to change the way students answer questions.

He mentioned it is often difficult to not jump the gun.

2) Most of the following [redacted] answered in question 1.

The following methods & materials are used.

- Practicals, before assignments, practical work
- Video clips, Youtube videos on ecology
- Boards, Visuals, Explanations
- Handcopy notes, Experiments, Online classroom
- Moodle (Courses), Documentaries
- Group work, Spot tests, Homework questions

3) [redacted] mentioned that he uses a blended learning approach which differs from traditional ways. He utilizes visuals, practicals, and applied teaching.

He did mention that there are limitations such as workload and class size.

He mentioned his approach is same as it was in the past.

Interview Cont.

4) [redacted] said that every year group is diff. The students are polite and on time in the morning and there's credits that there is a strict classroom environment.

He mentioned that if students do not attend classes that tends to be a low passing rate. The other problem is that students do not participate in class.

[redacted] mentioned that schools do not prepare students for uni as the students do not know how to take their own responsibility and look to make effort. The culture of work makes students recite things instead of answering in authentic ways. [redacted] said this is because they were given bad a previous education.

From [redacted] perspective as a teacher the challenge this year is a decrease in contact time w/ the students.

time is a problem. [redacted] with a focus to understand the time being consumed, there was a goal that to have a common with students' interests, as not everyone goes down group work.

5) [redacted] said that his classes give students a culture more and understanding of social sustainability - the importance of the knowledge of this world also play.

He stresses the importance of writing as it is more than just text. He explains the impact influences on the environment and helps the students to see the bigger picture.

6) The educational approach: Relationships need to be built to connect w/ students. Give critical input & consistency. Create up a professional plan letting the students know that it doesn't mean everything.

Interview Cont.

[redacted] mentioned that age does have an influence plus time is a big factor in the classroom.

Most of the times he encourages the students to stop him and ask questions if they do not understand, but they hate the change to ask. He also encourages students to help each other.

Other facts that [redacted] mentioned he uses in class:

- Moodle: Ask [redacted]
- Teams: Not used but is aware of its potential.

## Appendix 4 and 5: Written and Verbal Information

Good day, my name is Eileen Jooste, a student at Nelson Mandela University, George Campus. I am a student from the School of Natural Resource Management working on a masters' study titled: "A critical exploration of attitudes and knowledge about the management of natural resources: a case study of first-year natural resource management students at Nelson Mandela University". This research primarily aims to understand whether first-year students' attitudes and knowledge are changed within the first semester in terms of their classroom environment in relation to a specific module.

May I ask for your participation in the research?

(For students)

Participation in this research means being involved with: (1) filling out a classroom questionnaire and an online questionnaire, and (2) writing a short reflective essay, and (3) participating in an online voice/video recorded focus group interview. Your identity will be protected through means of an identification code when writing up results from the questionnaires and in interviews. The purpose of the questionnaire and reflective essay is to understand your attitudes and knowledge towards natural resources. The purpose of the focus group interviews is to obtain more detail on the questions asked within the questionnaires. Your identity will be protected by means of an identification code which will be allocated to your answers when recording the interview. *(When conducting the online interview, the researcher will ask students to re-affirm their consent and to turn off their camera so as to protect their anonymity throughout the research.)*

(For Lecturers)

Participation in this research means being involved with: (1) an online voice/video recorded semi-structured interview and (2) sharing students' marks for the first semester. Your identity will be protected through means of an identification code when recording and writing up the results of the research. *(When conducting the online interview, the researcher will ask the participant to re-affirm their consent).* The

## Appendix 4 and 5: Written and Verbal Information

purpose of the semi-structured interview is to obtain information on lecturers' approaches to teaching the students.

This project has been approved by NMU Ethics Committee: H19-SCI-NRM-007. Your participation is completely voluntary, and you can withdraw from the research at any time. The academic outcomes for the first semester may be obtained from each respective lecturer teaching an ecological module within the School of Natural Resource Management. Your privacy and anonymity will remain confidential at all times.

Benefits of the project may include refining environmental education modules in the School of Natural Resource Management, which will promote a constructive change within the learning environment for both the first-year SNRM students and three environmental lecturers. The data obtained from this research will be used for academic purposes only and might be used in longitudinal or comparative studies in the future. You will be able to attend a presentation and access the final results through the Nelson Mandela University library.

Do you have any questions about the project?

Are you willing to participate?

Please note that your academic progress will not be affected if you decide to not participate in the research.

Thank you for your contribution.

Eileen Jooste.

## Appendix 6: Semi-structure Interview

The purpose of this interview is to obtain your insights about the classroom environment that you teach in. Your participation is completely voluntary. You may withdraw from this questionnaire at any time. Your contributions will be handled confidentially, and your anonymity protected at all times. The data obtained from this interview will be used for academic purposes only and might be used in longitudinal or comparative studies in the future.

1. What is your teaching approach for the first-year (*Agriculture Management, Forestry, Nature Conservation*) module?
2. What type of methods and materials do you use when giving a class for (*Animal Production I, Forest Ecology, Conservation Ecology I*)?
3. How do you think your teaching method/approach differs from other lecturers?
4. What are your views on first-year students' attitudes and behaviour during the first semester, with regards to the (*Animal Production I, Forest Ecology, Conservation Ecology I*) classes?
5. How do you think your classes for (*Animal Production I, Forest Ecology, Conservation Ecology I*) change students?
  - a. Attitudes.
  - b. Behaviour.
  - c. Beliefs.
  - d. Knowledge.

## Appendix 7: Follow up Semi-structure Interview

The purpose of this interview is to obtain your insights about the classroom environment that you teach in. Your participation is completely voluntary. You may withdraw from this questionnaire at any time. Your contributions will be handled confidentially, and your anonymity protected at all times. The data obtained from this interview will be used for academic purposes only and might be used in longitudinal or comparative studies in the future.

1. In light of COVID – 19, how did the transition from online teaching and learning affect your teaching approach for (*Animal Production I, Forest Ecology, Conservation Ecology I*)?
  - a. How have your teaching and learning resources changed?
  - b. How has it changed your assessments of the students' progress?
  
2. In your opinion what benefits will the transition to online teaching and learning have for you?
  - a. What benefits will the transition to online teaching and learning have for the students?
  
3. In your opinion what challenges will the transition to online teaching and learning have for you?
  - a. or challenged you?



## Appendix 8: Questionnaire Codes

<b>Baseline Codes</b>		
<b>Code</b>	<b>Descriptor</b>	<b>Example Quotes</b>
A <sup>1</sup> . Connection with Industry	The students express a connection to their industry.	I have a big passion for farming.
A. Connection with Nature	The students express a connection to nature.	I am passionate about nature.
A. Feelings: Longing – Program Choice	The student expresses a desire to study something else.	I was going to do Medicinal Technology.
A. Opinion: Industry - Female	The student's perspective over the industry is female-centered.	As a female, I love to be hands-on in a male dominated department.
A. Opinion: Industry - Job Op.	The student's perspective over the industry is that it has a lot of job opportunities.	It has a lot of job opportunities.
A. Opinion: Industry - Key for Survival	The student's perspective over the industry is that it is the key to survival.	I believe in years to come agriculture will be key for us to survive.
A. Opinion: Industry - Managing Resources	The student's perspective over the industry is that it manages natural resources.	Mainly focus on keeping nature as it is.
A. Opinion: Industry - Protecting Resources	The student's perspective over the industry is that it protects natural resources.	We protect, promote the preservation of nature.
A. Opinion: Industry - Technology	The student's perspective over the industry is technologically centered.	I want to be one of the first people to be able to bring Agriculture in the 4th Industrial Revolution world we live in.
A. Opinion: Nature - Important	The student's perspective on the natural environment is that it is important.	I don't see a future if nature can't be conserved.
A. Opinion: Program - Study	The student's perspective over the program is that it is a study orientated towards their field.	It is beneficial to all those studying it and looking to get

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<sup>1</sup> Attitude

## Appendix 8: Questionnaire Codes

		diplomas and even further their studies.
A. Thought: Contribution - economy	The student thinks that they will be contributing to the economy one day.	I want to upgrade the economy of the country.
A. Thought: Contribution - future	The student thinks that they will be contributing to the sustainability of the future.	I want to secure nature for future generations.
A. Thought: Contribution - nature	The student thinks that they will be contributing to nature conservation.	I want to keep nature clean and protect wild animals.
A. Thought: Contribution - society	The student thinks that they will be contributing to society one day.	I want to make job opportunities for others.
A. Thought: Learning - industry	The student thinks that they will be learning more about the industry.	I would like to learn more about the operations of the industry.
A. Thought: Learning - knowledge	The student thinks that they will be learning and improving their knowledge overall.	I would like to gain knowledge and experience in the field.
A. Thought: Learning - nature	The student thinks that they will be learning more about nature.	I would like to learn more about nature.
A. Thought: Learning - skills	The student thinks that they will be learning new skills.	I would like to learn about new techniques in the field.
A. Thought: Owning a business	The student thinks that they will be able to own a business one day.	I want to own a business one day.
A. Thought: Working for the industry	The student thinks that they will be working for the industry one day.	I think choosing this career may bring me more opportunities in the career field.
K <sup>2</sup> . Association: Industry	The student conveys that they have a connection with the industry.	I love to be involved in agricultural things.

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<sup>2</sup> Knowledge

## Appendix 8: Questionnaire Codes

K. Association: Nature	The student has a connection with nature.	I enjoy the outdoors.
K. Concerns: Economy	The student expresses a concern for the economy.	I want to upgrade the economy of the country.
K. Concerns: Future	The student expresses a concern for the future.	To secure nature for future generations.
K. Concerns: Nature	The student expresses a concern for nature.	I want to keep nature clean and protect wild animals.
K. Concerns: Society	The student expresses a concern for society.	I want to make job opportunities for others.
K. Experience: Family/childhood	The student has had previous experience in the field due to their family or childhood.	I grew up in plantations.
K. Experience: School	The student has had previous experience in the field due to their schooling.	I studied agriculture in school.
K. Experience: Work	The student has had previous experience in the field due to having worked for the industry.	I worked for a forest company and wanted to further my education.
K. Not understanding Program	The student does not understand what the program is about.	At the moment I am clueless.
K. Understanding: Agri	The student understands that the program is about agriculture-related concepts.	It is about farming with cattle and vegetables.
K. Understanding: Frst	The student understands that the program is about forestry related concepts.	It is about plantations and planting trees.
K. Understanding: Nat	The student understands that the program is about nature conservation related concepts.	It is about protecting nature and the environment.

<b>Post-Intervention Codes</b>		
<b>Code</b>	<b>Descriptor</b>	<b>Example Quotes</b>
Changed view: Environment	The student's views of the natural environment have changed.	My perspective towards nature has changed instead of being scared a lot.
Changed view: Industry	The student's views of the industry have changed.	The future of the industry in our hands.

## Appendix 8: Questionnaire Codes

Influences: Classmates	The student noted that their classmates highly influenced their current views about the program/module/industry.	Rating scale, no additional comments.
Influences: Classroom environment	The student noted that their classroom environment highly influenced their current views about the program/module/industry.	Rating scale, no additional comments.
Influences: Community	The student noted that their community highly influenced their current views about the program/module/industry.	Rating scale, no additional comments.
Influences: Ecological module	The student noted that their ecological module highly influenced their current views about the program/module/industry.	Rating scale, no additional comments.
Influences: Family	The student noted that their family highly influenced their current views about the program/module/industry.	Rating scale, no additional comments.
Influences: Friends	The student noted that their friends highly influenced their current views about the program/module/industry.	Rating scale, no additional comments.
Influences: Job opportunity	The student noted that job availability and opportunities highly influenced their current views about the program/module/industry.	Rating scale, no additional comments.
Influences: Lecturer	The student noted that their ecology lecturer highly influenced their current views about the program/module/industry.	Rating scale, no additional comments.
Influences: Love for nature	The student noted that their love for nature highly influenced their current views about the program/module/industry.	Rating scale, no additional comments.
Influences: Other modules	The student noted that other modules that they have highly	Rating scale, no additional comments.

## Appendix 8: Questionnaire Codes

	influenced their current views about the program/module/industry.	
Influences: Social media	The student noted that their social media highly influenced their current views about the program/module/industry.	Rating scale, no additional comments.
Influences: Students in other programs	The student noted that students in other programs highly influenced their current views about the program/module/industry.	Rating scale, no additional comments.
Learned: Agriculture Ecology concepts	The student stated that they have learned about different agricultural concepts, in terms of ecology.	Anatomy and physiology of animals with regards to Animal Production.
Learned: Changed perspective	The student stated that their perspective/interest shifted and changed during the semester, in terms of the ecological module.	A lot of my thoughts have changed.
Learned: Conservation Ecology concepts	The student stated that they have learned about different conservation concepts, in terms of ecology.	I have a much better understanding of the biotic environments than other chapters in this ecology.
Learned: Forest Ecology concepts	The student stated that they have learned about different forestry concepts, in terms of ecology.	I have learned about the importance of biodiversity, how some species prevent the collapsing environment, and ecological concepts.
Learned: Gained knowledge	The student stated that they gained knowledge during the semester, in terms of their ecological module.	I have learned about agriculture ecology/forest ecology/conservation ecology.
Online teaching and learning: Adapted to it	The student mentioned that they adapted to online teaching and learning.	At first, it seemed impossible, but I managed to work my way around it and adapt.

## Appendix 8: Questionnaire Codes

Online teaching and learning: Allow to continue studies	The student mentioned that online teaching and learning allows them to proceed with their studies.	It is not very easy, but the fact is that we are still continuing with our studies.
Online teaching and learning: Bad communication	The student mentioned that communication around online teaching and learning is not ideal (Lecturers and the University)	I feel like they did not communicate with us well.
Online teaching and learning: Barrier to resources	The student mentioned that online teaching and learning was a barrier to them as they were not able to access the resources effectively.	I had issues for the first semester like the network.
Online teaching and learning: Difficulty learning	The student mentioned that they failed a module because of having to transition to online teaching and learning.	I struggled with some of the modules while studying online, it has not been a smooth ride.
Online teaching and learning: Good communication	The student mentioned that communication from their lecturers is good in terms of online teaching and learning.	The lecture gave his best to work with us.
Online teaching and learning: Hard	The student mentioned that the transition to online teaching and learning is not easy.	Most of the time I feel like it is a hard path to follow.
Online teaching and learning: Home Implications	The student mentioned that the transition to online teaching and learning is difficult as they have other responsibilities at home, hindering their time to study.	It has made me struggle with my assignments and tests because of being at home.
Online teaching and learning: Independence	The student mentioned that with online teaching and learning that they have become more independent when having to learn/study.	It helps us to be independent.
Online teaching and learning: Lack of knowledge and skills	The student mentioned that the transition to online teaching and learning was not ideal as they did not have the proper skills or enough knowledge	Not all of us are used to computer skills.

## Appendix 8: Questionnaire Codes

	about the module to transition to online teaching and learning.	
Online teaching and learning: Learning changed	The student mentioned that the transition to online teaching and learning changed their way of learning.	It has changed the way I learn drastically.
Online teaching and learning: Learning no change	The student mentioned that online teaching and learning did not affect their way of learning.	It did not affect my learning at all.
Online teaching and learning: More time to study	The student mentioned that with online teaching and learning that they had more time to study.	I have more time to learn.
Online teaching and learning: Online skills	The student mentioned that online teaching and learning improved their online skills and experiences.	It thought me to use technology more frequently.
Online teaching and learning: Practicals reduced	The student mentioned that online teaching and learning took away the practical element of their learning.	No practicals were done this year.
Online teaching and learning: Prefer face-to-face	The student mentioned that they prefer the face-to-face element of teaching.	I prefer the classroom set up.
Online teaching and learning: Prefer online classes	The student mentioned that they prefer the online element of teaching.	I now enjoy learning more so than in class.
Online teaching and learning: Time limitations	The student stated that they experience time limitations with the transition to online teaching and learning.	It gave me less time to better prepare.
Online teaching and learning: Views of Uni changed	The student stated that their views on the university have changed, due to the transition to online teaching and learning.	I no longer feel the same way about the university.

## Appendix 9: Semi-structured Interview Codes

<b>Semi Structured Interview Codes</b>		
<b>Code</b>	<b>Descriptor</b>	<b>Quotes</b>
Materials - Journal articles	The lecturer makes use of journal articles as materials when teaching.	To explain some concepts better journal articles as well, obviously as well, here and there for further reading.
Materials - Note pack	The lecturer makes use of a note pack as a material when teaching.	We give them hardcopy notes.
Materials - Study guide	The lecturer makes use of a study guide as a material when teaching.	I give them a study guide.
Materials - Visuals	The lecturer makes use of visual aids as a material when teaching.	I apply more of an interactive, visual type of learning approach.
Materials - Visuals: Presentations	The lecturer makes use of presentations as a method when teaching.	Always presentations.
Materials - Visuals: Videos	The lecturer makes use of videos as a material when teaching.	I use a lot of YouTube videos, a lot, all of the different kinds of things, and I use different kinds. I use funny ones, some of them are like songs, some of them are really serious videos.
Method - Assessment: spot checks	The lecturer makes use of spot checks to evaluate/assess students as a teaching method.	I will do kind of like spot-checks throughout to see what they are on about.
Method - Evaluation: assignments	The lecturer mentions they evaluate students through assignments	I give them assignments.
Method - Evaluation: tests	The lecturer mentions they evaluate students through tests	I told them that we would be writing a test.
Method - Excursions	The lecturer makes use of practical excursions as a teaching method.	I like to also take a walk on campus and then show them the things we talked about.
Method - Team Work	The lecturer makes use of group work as a teaching method.	We do a lot of group work.
Platform - Moodle	The lecturer makes use of the Moodle platform when teaching.	We use the Moodle platform.
OT <sup>3</sup> - Assessments: Challenging	The transition to online teaching and learning has been challenging	It has been difficult for me to determine whether the students

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<sup>3</sup> Online Teaching



## Appendix 9: Semi-structured Interview Codes

		for lecturers in terms of assessing students.	have understood what I am trying to teach them.
OT Assessments: Plagiarism	-	The transition to online teaching and learning has been challenging for the lecturer as students tend to plagiarize their work.	Students copy and paste and have heavily plagiarized essays, and I can see that.
OT Assessments: Quizzes	-	The transition to online teaching and learning has changed to assessing students with quizzes.	We've had a quiz for each section of the work.
OT Assessments: Reflective essay	-	The transition to online teaching and learning has changed to assessing students with reflective essays.	I give them a reflective essay to do.
OT Assessments: Worksheets	-	The transition to online teaching and learning has changed to assessing students with worksheets.	The main assessments have been the quizzes, worksheets, and a reflective essay.
OT lecturer: Reusable material	- Benefit	The transition to online teaching and learning has been beneficial to the lecturer in terms of having reusable materials.	The video lectures that I have taken now can be used again in the future.
OT lecturer: Technology	- Benefit	The transition to online teaching and learning has been beneficial to the lecturer in terms of the ease of technology.	I think the whole COVID thing was a blessing in disguise when it comes to technology. It has forced a lot of people out of their comfort zones.
OT lecturer: Work from home	- Benefit	The transition to online teaching and learning has been beneficial to the lecturer as they can work from home.	For me, it was amazing to be working from home.
OT students: Access to materials	- Benefit	The transition to online teaching and learning has been beneficial to the students, from the lecturer's point of view, in terms of having access to materials online.	They have access at home to the internet and stuff.
OT students: Cost saving	- Benefit	The transition to online teaching and learning has been beneficial to the students, from the lecturer's point of view, in terms of saving on studies (more so in the future).	There is a cost-saving for some of them that don't need to come back to the university.
OT students: Online skills	- Benefit	The transition to online teaching and learning has been beneficial to the students, from the	There is a lot of opportunity for growth in both skills.

## Appendix 9: Semi-structured Interview Codes

	lecturer's point of view, in terms of gaining online skills.	
OT - Benefit students: Own pace	The transition to online teaching and learning has been beneficial to the students, from the lecturer's point of view, in terms of studying at their own pace.	Now they have lectures in video format that they can pause and take notes and relisten or rewatch if they want to.
OT - Benefit students: Stress relief	The transition to online teaching and learning has been beneficial to the students, from the lecturer's point of view, in terms of eliminating the stress associated with the class, exams, and tests.	It eliminates the intimidation of being in class and the stress associated with exams and re-exams.
OT - Challenge lecturer: Balancing work/life	The transition to online teaching and learning has been challenging for lecturers in terms of balancing their work life and social life.	Initially, it was quite challenging to balance personal and work life.
OT - Challenge lecturer: No contact sessions	The transition to online teaching and learning has been challenging to the lecturer in terms of not having any contact sessions with students.	I prefer the contact sessions very much than online. With the contact sessions, I was able to contact students at a more personal level.
OT - Challenge lecturer: No practical teaching	The transition to online teaching and learning has been challenging to the lecturer in terms of not having any practical sessions with students.	We learn by seeing, doing, touching, and feeling. Having lost all of that puts me at a disadvantage and worst for my students.
OT - Challenge lecturer: Other duties	The transition to online teaching and learning has been challenging for the lecturer in terms of having other duties as a lecturer.	I have got so many other administrative things.
OT - Challenge lecturer: Student communication	The transition to online teaching and learning has been challenging for the lecturer in terms of students' communication with them.	They will be completely silent or passive. It feels like I am talking to myself.
OT - Challenge lecturer: Time consuming	The transition to online teaching and learning has been challenging to the lecturer in terms of it being time consuming.	That takes away a lot of the time you have available.
OT - Challenge lecturer: University communication	The transition to online teaching and learning has been challenging for the lecturer in terms of	The communication from the university, both from the lecturer and the university, as a whole that it's inadequate.

## Appendix 9: Semi-structured Interview Codes

	communication from the university and lecturers.	
OT - Challenge students: Lack of practical knowledge	The transition to online teaching and learning has been challenging to the students, from the lecturer's point of view, in terms of their general understanding of things.	Most of my students are coming from a background where they do not know or cannot differentiate between a meat breed and a dairy breed.
OT - Challenge students: Online access	The transition to online teaching and learning has been challenging to the students, from the lecturer's point of view, in terms of having access to online resources.	Access to the resources becomes a serious problem for the students as well.
OT - Challenge students: Overcomplicate things	The transition to online teaching and learning has been challenging to the students, from the lecturer's point of view, in terms of them making things complicated for themselves.	They struggle with the worksheet; I think they might be overthinking it.
OT - Challenge students: Pushed to do online	The transition to online teaching and learning has been challenging to the students, from the lecturer's point of view, in terms of feeling pushed to do online teaching and learning.	I do not want to be noted as the lecture who told them to do things in a certain way.
OT - Challenge students: Time management	The transition to online teaching and learning has been challenging for the students, from the lecturer's point of view, in terms of time management.	Another potential issue is time-management.
OT - Challenge students: Workload	The transition to online teaching and learning has been challenging to the students, from the lecturer's point of view, in terms of additional work.	I think we went overkill with the assessment part.
OT - Teaching approach: Adapted	The transition to online teaching and learning made the lecturer have to adapt their teaching approach.	I have had to change so many things. I have had to adapt to certain aspects.
OT - Teaching approach: Frustrating	The transition to online teaching and learning is frustrating for the lecturer.	It has been a rough time.

## Appendix 9: Semi-structured Interview Codes

OT - Teaching approach: Hasn't changed	The transition to online teaching and learning has not changed the teaching approach of the lecturer.	The way that I've been doing, I've been using a lot of Multi-things anyway, so it hasn't changed much.
OT - Teaching approach: No contact sessions	The transition to online teaching and learning has taken away the face-to-face teaching approach.	We don't have the face-to-face class interaction anymore.
Platform - Teams	The lecturer makes use of the Teams platform when teaching.	Microsoft Teams is a powerful tool that's available to us.
TA <sup>4</sup> - Applied	The lecturer makes sure that the students apply what they are being taught, through interaction. The lecturer makes use of practical examples when teaching the students, the module. According to the lecturer, the students can apply what they are being thought through this applied approach.	I use an applied approach.
TA - Applied: African Examples	The lecturer makes use of African examples when teaching the students, the module.	What I like about that is African examples, a lot of times you know the examples we get are just the stuff that we do not know what Elk are, we do not know about wolves and things you know it is not something that we deal with.
TA - Applied: Current Surrounding Examples	The lecturer makes use of current surroundings (university grounds) as examples when teaching the students, the module.	I will use practical scenarios; in practical situations, I even make an example of the grass we see outside.
TA - Same Level	The lecturer makes sure that everyone is on the same level of understanding when teaching the module. The lecturer helps the students to understand the module by explaining the basics and making it easier for the students to understand the content. Students come into university and are not always	My approach is to bring everyone up to the same level of understanding regarding your ecology and nature and where we all fit into the system.

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<sup>4</sup> Teaching Approach

## Appendix 9: Semi-structured Interview Codes

	familiar with the "basics" of the module.	
TA. - Limitations: Class size	The lecturer mentions that the class size limits their teaching approach.	The class size, I've got 80 students and you know to go out and find a place where everybody can hear and see what you are on about you know that makes it difficult as well.
TA. - Limitations: Methods	The lecturer mentions that the methods used to teach can be a limitation.	I am unable to perform certain functions, in general, the module is a practical course and we have to go out a lot, which is not always easy to do.
TA. - Limitations: Time	The lecturer mentions that there are time limitations when teaching.	Time is a very big issue at the moment. We're understaffed and it's just too much going on.
TA. - Limitations: Workload	The lecturer mentions that workload is a limitation when teaching.	Things that are expected of us prevent you from actually implementing new approaches.
TA. Contribution - Interest change	The lecturer mentions that their module and class change the interest of the students. In terms of them only focusing on one element when coming to study, their interest shifts to something else after experiencing all the elements the module has to offer them. A Mindshift is sparked.	I think that they tend to start developing an interest in different things. They may come herewith, you know wanting to work with lions or wanting to work with elephants, but then through ecology, or what I try to do in any case, is get them a little more interested in plants and how that all, how those things all function and how the animals and plants are interlinked and not just, you know what they're interests were.
TA. Contribution - Knowledge, and understanding	The lecturer mentions that their classes contribute to an increase in knowledge and understanding of the module. Students at first are unsure and do not understand much but increase their knowledge capacity as they continue the semester.	Students need to understand everything or gain knowledge about a variety of things for everything to make sense.
TA. Contribution - Realistic views	The lecturer mentions that their class prepares the student with a realistic understanding and view of the world.	Well, I would hope that if they complete my class that they would have a more realistic view of the world.

## Appendix 9: Semi-structured Interview Codes

TA. Contribution - Prepare for career	The lecturer mentions that their classes contribute to preparing the student for a career in the field.	Eventually, they will be involved in farming enterprises.
TA. Differs - Module contents	The lecturer mentions the difference of the application that their teaching approach has when it comes to the different modules among programs.	It is part of what I have to apply that may be slightly different from whoever is teaching plants.
TA. Differs - Multidisciplinary	The lecturer brings in other elements from other subjects or topics. The focus is not just on the ecological module content, but other modules or topics.	Even though we are talking about ecology and I may be talking for example about the water cycle, there may pop up something that I will then delve in a little bit more that isn't in the notes, it is not in the presentation but it is something interesting that will give them more background or will help them figure out something else, something from a different subject.
TA. Differs - Not the same	The lecturer states that their approach is different from the way that they were taught when they were students or in school.	The approach that I have now is slightly different from how I was taught. Because obviously, I was a different type of student then, we've got a different type of students now.
TA. Differs- Same as always	The lecturer mentions that their approach is the same way it has been since they started teaching.	I think it is pretty much the same way it has been done since forever.
V <sup>5</sup> - Backgrounds: Black African: English	The lecturer mentions that English is a barrier for African Students.	A lot of them do struggle a lot with English and comprehension with English.
V - Backgrounds: Black African: Take time	The lecturer mentions that African Students often take some time before understanding university aspects.	They take time to get into the groove of things.
V - Changes with semester	The students change and improve as the semester progresses. In the second semester they usually	They were very quiet, very reserved but comes to the end of the semester, the second semester they are livelier.

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<sup>5</sup> Views

## Appendix 9: Semi-structured Interview Codes

	"find themselves". They become more confident. They know more.	
V - Differs from student to student	The students are different from each other and year.	Well, every year group is different you can see it some years are just better other years the students struggle a bit more.
V - Emotional	The lecturer states that the students appear to be emotional. They struggle with the changes from school to university as they appear unsure, scared, or shy at first.	What I have observed is that in first-years, the students are going through a lot of emotions and we are offering a module and pitching it at a slightly higher level than what they are accustomed to.
V - Lack of courage	The students lack the courage to ask for help.	They don't have the courage to tell you to listen I'm feeling lost.
V - Relationship with students	The lecturer states that it is important to have a good relationship with the students when teaching them.	It is important that you kind of build a relationship with your students. There needs to be mutual trust and respect and different people do it in different ways.
V - Schooling	The schooling of the student plays a role when they enter university.	First-year students are not prepared for university, you know you use these words and all those really basic and things you would expect them to know almost from primary school.
V - Unwilling: Participate	The students do not always participate in the classroom environment or to go the extra mile.	One of the big problems I have with my class or many of the cohorts that come through is that they don't participate.



PO Box 77000, Nelson Mandela University, Port Elizabeth, 6031, South Africa [mandela.ac.za](http://mandela.ac.za)

Chairperson: Research Ethics Committee (Human)

Tel: +27 (0)41 504 2235

[charmain.cilliers@mandela.ac.za](mailto:charmain.cilliers@mandela.ac.za)

NHREC registration nr: REC-042508-025 Ref: [H19-SCI-NRM-007] / Approval]

14 December 2019

Dr B Currie

Faculty: Science

Dear Dr Currie

A CRITICAL EXPLORATION OF ATTITUDES AND KNOWLEDGE ABOUT THE MANAGEMENT OF NATURAL RESOURCES: A CASE STUDY OF FIRST-YEAR NATURAL RESOURCE MANAGEMENT STUDENTS AT NELSON MANDELA UNIVERSITY

PRP: Dr B Currie

PI: Ms E Jooste

The above-entitled application served at the Research Ethics Committee (Human) (*meeting of 27 November 2019*) for approval. The research is classified as a medium risk study. The ethics clearance reference number remains **H19-SCI-NRM-007** and approval is subject to the following conditions:

1. The immediate completion and return of the attached acknowledgement to [Imtiaz.Khan@mandela.ac.za](mailto:Imtiaz.Khan@mandela.ac.za), the date of receipt of such returned



acknowledgement determining the final date of approval for the research where after data collection may commence.

2. Approval for data collection is for 1 calendar year from date of receipt of above-mentioned acknowledgement.

3. The submission of an annual progress report by the PRP on the data collection activities of the research

(form RECH-004 to be made available shortly on Research Ethics Committee (Human) portal) by 15 November this year for studies approved/extended in the period October of the previous year up to and including September of this year, or 15 November next year for studies approved/extended after September this year.

4. In the event of a requirement to extend the period of data collection (i.e., for a period in excess of 1 calendar year from date of approval), completion of an extension request is required (form RECH-005 to be made available shortly on Research Ethics Committee (Human) portal)

5. In the event of any changes made to the research (excluding extension of the research), completion of an amendments form is required (form RECH-006 to be made available shortly on Research Ethics Committee (Human) portal).

6. Immediate submission (and possible discontinuation of the research in the case of serious events) of the relevant report to RECH (form RECH-007 to be made available shortly on Research Ethics Committee (Human) portal) in the event of any unanticipated problems, serious incidents or adverse events observed during the course of the research.

7. Immediate submission of a Study Termination Report to RECH (form RECH-008 to be made available shortly on Research Ethics Committee (Human) portal) upon unexpected closure/termination of study.

8. Immediate submission of a Study Exception Report of RECH (form RECH-009 to be made available shortly on Research Ethics Committee (Human) portal) in the event of any study deviations, violations and/or exceptions.

## Appendix 10: Ethics Approval 2019

9. Acknowledgement that the research could be subjected to passive and/or active monitoring without prior notice at the discretion of the Research Ethics Committee (Human).

2

Please quote the ethics clearance reference number in all correspondence and enquiries related to the research. For speedy processing of email queries (to be directed to [Imtiaz.Khan@mandela.ac.za](mailto:Imtiaz.Khan@mandela.ac.za)), it is recommended that the ethics clearance reference number together with an indication of the query appear in the subject line of the email.

We wish you well with the research.

Yours sincerely



Prof C Cilliers

Chairperson: Research Ethics Committee (Human)

Cc: Department of Research Capacity Development  
Faculty Officer: Science

Appendix 1: Acknowledgement of conditions for ethical approval

3

### APPENDIX 1 ACKNOWLEDGEMENT OF CONDITIONS FOR ETHICS APPROVAL

I, DR B CURRIE (PRP) OF THE RESEARCH ENTITLED A CRITICAL EXPLORATION OF ATTITUDES AND KNOWLEDGE ABOUT THE MANAGEMENT  
xxxviii

OF NATURAL RESOURCES: A CASE STUDY OF FIRST-YEAR NATURAL RESOURCE MANAGEMENT STUDENTS AT NELSON MANDELA UNIVERSITY (H19-SCI-NRM007), DO HEREBY AGREE TO THE FOLLOWING APPROVAL CONDITIONS:

1. The submission of an annual progress report by myself on the data collection activities of the research by 15

November this year for studies approved in the period October of the previous year up to and including September of this year, or 15 November next year for studies approved after September this year. It is noted that there will be no call for the submission thereof. The onus for submission of the annual report by the stipulated date rests on myself.

2. Submission of the relevant request to RECH in the event of any amendments to the research for approval by RECH prior to any partial or full implementation thereof.

3. Submission of the relevant request to RECH in the event of any extension to the research for approval by RECH prior to the implementation thereof.

4. Immediate submission of the relevant report to RECH in the event of any unanticipated problems, serious incidents, or adverse events.

5. Immediate discontinuation of the research in the event of any serious unanticipated problems, serious incidents, or serious adverse events.

6. Immediate submission of the relevant report to RECH in the event of the unexpected closure/discontinuation of the research (for example, de-registration of the PI).

Appendix 10: Ethics Approval 2019

7. Immediate submission of the relevant report to RECH in the event of study deviations, violations and/or exceptions.

8. Acknowledgement that the research could be subjected to passive and/or active monitoring without prior notice at the discretion of RECH.

Signed: \_\_\_\_\_

Date:

\_\_\_\_\_



PO Box 77000, Nelson Mandela University, Port Elizabeth, 6031, South Africa [mandela.ac.za](http://mandela.ac.za)

Chairperson: Research Ethics Committee (Human)

Tel: +27 (0)41 504 2347

[sharlene.govender@mandela.ac.za](mailto:sharlene.govender@mandela.ac.za)

NHREC registration nr: REC-042508-025 Ref: [H19-SCI-NRM-007] / Amendment]

25 June 2020

Dr B Currie

Faculty: Science

Dear Dr Currie

A CRITICAL EXPLORATION OF ATTITUDES AND KNOWLEDGE ABOUT THE  
MANAGEMENT OF  
NATURAL RESOURCES: A CASE STUDY OF FIRST-YEAR NATURAL RESOURCE  
MANAGEMENT STUDENTS AT NELSON MANDELA UNIVERSITY

PRP: Dr B Currie

PI: Ms E Jooste

The request for an amendment to the above-entitled application served at the Research Ethics Committee (Human) for approval. The research is classified as a medium risk study. The ethics clearance reference number remains **H19-SCI-NRM-007** and approval is subject to the following conditions:

1. The immediate completion and return of the attached acknowledgement to [Imtiaz.Khan@mandela.ac.za](mailto:Imtiaz.Khan@mandela.ac.za), the date of receipt of such returned acknowledgement

## Appendix 11: Ethics Approval 2020

determining the final date of approval for the research where after data collection may commence.

2. Approval for data collection is for 1 calendar year from date of receipt of above-mentioned acknowledgement.
3. The submission of an annual progress report by the PRP on the data collection activities of the research (form RECH-004 available on Research Ethics Committee (Human) portal) by 15 November this year for studies approved/extended in the period October of the previous year up to and including September of this year, or 15 November next year for studies approved/extended after September this year.
4. In the event of a requirement to extend the period of data collection (i.e., for a period in excess of 1 calendar year from date of approval), completion of an extension request is required (form RECH-005 available on Research Ethics Committee (Human) portal)
5. In the event of any changes made to the research (excluding extension of the research), completion of an amendments form is required (form RECH-006 available on Research Ethics Committee (Human) portal).
6. Immediate submission (and possible discontinuation of the research in the case of serious events) of the relevant report to RECH (form RECH-007 available on Research Ethics Committee (Human) portal) in the event of any unanticipated problems, serious incidents or adverse events observed during the course of the research.
7. Immediate submission of a Study Termination Report to RECH (form RECH-008 available on Research Ethics Committee (Human) portal) upon expected or unexpected closure/termination of study.
8. Immediate submission of a Study Exception Report of RECH (form RECH-009 available on Research Ethics Committee (Human) portal) in the event of any study deviations, violations and/or exceptions.
9. Acknowledgement that the research could be subjected to passive and/or active monitoring without prior notice at the discretion of Research Ethics Committee (Human).

2

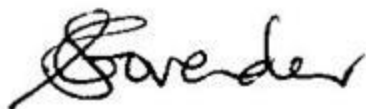
Please quote the ethics clearance reference number in all correspondence and enquiries related to the research. For speedy processing of email queries (to be directed to

## Appendix 11: Ethics Approval 2020

[Imtiaz.Khan@mandela.ac.za](mailto:Imtiaz.Khan@mandela.ac.za)), it is recommended that the ethics clearance reference number together with an indication of the query appear in the subject line of the email.

We wish you well with the research.

Yours sincerely



Dr S Govender

Chairperson: Research Ethics Committee (Human)

Cc: Department of Research Capacity Development  
Faculty Officer: Science

### Appendix 1: Acknowledgement of conditions for ethical approval

3

#### APPENDIX 1 ACKNOWLEDGEMENT OF CONDITIONS FOR ETHICS APPROVAL

I, DR B CURRIE (PRP) of the research entitled [H19-SCI-NRM-007] A CRITICAL EXPLORATION OF ATTITUDES AND KNOWLEDGE ABOUT THE MANAGEMENT OF NATURAL RESOURCES: A CASE STUDY OF FIRSTYEAR NATURAL RESOURCE MANAGEMENT STUDENTS AT NELSON MANDELA UNIVERSITY, do hereby agree to the following approval conditions:

1. The submission of an annual progress report by myself on the data collection activities of the research by 15

November this year for studies approved in the period October of the previous year up to and including September of this year, or 15 November next year for studies approved after September this year. It is noted that there will be no call for the submission thereof. The onus for submission

## Appendix 11: Ethics Approval 2020

of the annual report by the stipulated date rests on myself. I am aware of the guidelines (available on Research Ethics Committee (Human) portal) pertinent to the submission of the annual report.

2. Submission of the relevant request to RECH in the event of any amendments to the research for approval by RECH prior to any partial or full implementation thereof. I am aware of the guidelines (available on Research Ethics Committee (Human) portal) pertinent to the requesting for any amendments to the research.

3. Submission of the relevant request to RECH in the event of any extension to the research for approval by RECH prior to the implementation thereof.

4. Immediate submission of the relevant report to RECH in the event of any unanticipated problems, serious incidents, or adverse events. I am aware of the guidelines (available on Research Ethics Committee (Human) portal) pertinent to the reporting of any unanticipated problems, serious incidents, or adverse events.

5. Immediate discontinuation of the research in the event of any serious unanticipated problems, serious incidents, or serious adverse events.

6. Immediate submission of the relevant report to RECH in the event of the unexpected closure/discontinuation of the research (for example, de-registration of the PI).

7. Immediate submission of the relevant report to RECH in the event of study deviations, violations and/or exceptions. I am aware of the guidelines (available on Research Ethics Committee (Human) portal) pertinent to the reporting of any study deviations, violations and/or exceptions.

8. Acknowledgement that the research could be subjected to passive and/or active monitoring without prior notice at the discretion of RECH. I am aware of the guidelines



Appendix 11: Ethics Approval 2020

(available on Research Ethics Committee (Human) portal) pertinent to the active monitoring of a study.

Signed: \_\_\_\_\_  
\_\_\_\_\_

Date:

## Appendix 12: Informed Consent Form

Consent to take part in all parts of the research titled: “A critical exploration of attitudes and knowledge about the management of natural resources: a case study of first-year natural resource management students at Nelson Mandela University”. This research primarily aims to understand whether first-year students’ attitudes and knowledge are changed within the first semester in terms of their classroom environment in relation to a specific module. May I ask for your participation in the research?

I declare that I am over the age of 18 and willingly agree to participate in this research study. I also declare that the research has been explained to me and that the following rights as a participant in this research have been explained to me:

- I understand that my participation is of a voluntary nature and that I can withdraw from this research at any time.
- I understand that even if I agree to participate now, I have a choice to refuse to answer any question without any confrontations of any kind.
- I understand that I will not benefit from partaking in this research, nor will my research have any bearing on my academic progress at the university.
- I understand that I may be asked to participate in all aspects of the research which include: (1) filling out a classroom questionnaire and online questionnaire, and (2) participating in a written essay and (3) participating in an online voice recorded/video recorded focus group interview – *for students*. (4) an online voice recorded/ video recorded semi-structured interview – *for lecturers*.
- I understand that all information I provide will be treated confidentially.
- I understand that my identity will remain anonymous.
- I understand that the viewpoints that I express might be used in presentations and a manuscript as outputs of this research, but in no way will be associated to me personally.
- I understand that the data generated from this research could be reused in comparative or longitudinal studies in the future and I give my consent for its reuse.
- I understand that the academic outcomes for the first semester may be obtained from each respective lecturer teaching an ecological module within the School of Natural Resource Management.

## Appendix 12: Informed Consent Form

### Online Consent

- I understand by partaking in the Moodle questionnaire that my responses will remain anonymous to other students.
- I understand that by partaking in the Moodle questionnaire that my responses can be viewed by the lectures. I am aware that I will receive no favor or be prejudiced against for my participation in the research. No repercussions will come from my participation, as my participation remains voluntary, and my academic progress will not be affected in anyway.
- I understand that once I have completed the Moodle questionnaire that my responses will be downloaded and protected through a false name and deleted from the Moodle platform to prevent further viewing of my response.
- I understand that this research has been approved by the Nelson Mandela University, Human Ethics Committee. The clearance number is: **H19-SCI-NRM-007**

I agree to participate in this research.

Name of research participant (*will not be revealed*): \_\_\_\_\_

Date: \_\_\_\_\_

This research study is conducted by Eileen Jooste a student at Nelson Mandela University, under the supervision of Dr. Bianca Currie and Prof. Jenny Clarence-Fincham at the Nelson Mandela University. For further information please contact Eileen Jooste at **s214019101@mandela.ac.za**, Dr. Bianca Currie at **bianca.currie@mandela.ac.za** or Prof. Jenny Clarence-Fincham at **jennycf@mandela.ac.za**