Exploring the Youths' Awareness and Knowledge of Climate Change: An analysis of early first-year students' perceptions of climate change within a South African University

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ABSTRACT

The effects of climate change are already discernible however this is predicted to be more prevalent in the future years and so will impact the younger generations to a greater extent. The prevailing question however is whether the South African youth are equipped with knowledge and are aware of this potential threat; this would then give an indication of their potential to devise future mitigation measures. Thus the aim of this study was to investigate the level of awareness and knowledge of climate change held by our future leaders, i.e. the youth of South Africa. The study utilised a qualitative approach and a descriptive design and convenience sampling. This study was conducted via online survey and all 700 Introductory Life Sciences (ILS) students were invited into the study and 29 responses were received. Thematic analysis was utilised and responses were coded and analysed to determine the patterns and themes emerging from data. This study found significant student understanding regarding the causes of climate change. Respondents were observed to have experience nature at varying degrees through the schooling curriculum and life experiences. They were also able to describe, explain and understand environmental concepts; allowing them to develop environmental attitudes leading to possible behavioural outputs such as conceptualisation of impact mitigation measures. This indicates the significance of incorporating climate change education within the high school curriculum. This observation should thus encourage a similar conception within the University context with climate change education incorporated within all disciplines and not confined to natural sciences syllabus; thus ensuring that all students will be better equipped for climate change impact mitigation across varied career paths.

DECLARATION

I Lungile Nontuthuzelo Nongqayi, declare that this thesis is my own, unaided work. It is being submitted for the degree of Master of Science at the University of the Witwatersrand, Johannesburg. It has not been submitted before for any degree or examination in any other University.

Lungile Nontuthuzelo Nongqayi

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To my late grandparents who never had an opportunity to study but always made sure that I grabbed every opportunity to learn with both hands.

My mother a prayer warrior who has lead by example both academically and life in general.

My sister and my cheerleader; God made you my sister but life made you my best friend and greatest cheerleader.

My Husband Charles, you are the epitome of God's Grace.

My daughters there is no excuse go out there and shine!

To my Lord and saviour; I am Yours and You are Mine.

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CHAPTER 1

1. INTRODUCTION

Climate change has become a highly pressing topic as scientists continue to reveal evidence of its existence and links to human activities as contributing factors to its exacerbation. This observation has evoked a keen interest in scientist and global governments into finding interventions to minimise and mitigate the negative impacts allied with climate change; one of these interventions include increasing the level of awareness of this issue. In South Africa one of the ways government has attempted to increase knowledge and awareness has been to have it incorporated into the high schooling curriculum between grades 8 through to 12 (Anyanwu, et al., 2015).

1.1 Climate Change

The Intergovernmental Panel on Climate Change (IPCC) defines climate change as "any change in climate over time, whether due to natural variability or as a result of human activity" (IPCC, 2007). They highlight how this definition varies from how the Framework Convention on Climate Change describes it as being "a change of climate that is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and that is in addition to natural climate variability observed over comparable time periods" (IPCC, 2007). In the South African context, Ziervogel et al. (2014) highlight how climate change has become evident by the increasing of mean annual temperatures and the increased occurrence of rainfall events. Furthermore they elucidate how these changes make South Africa more susceptible to a number of issues that will increase poverty and inequality ranging from depletion of water resources, increased food insecurity and damage to infrastructure and ecosystems (Ziervogel, *et al*., 2014).

Climate change is explained by Chiw and Ling (2019) as "any alteration in the climate over a period of time, including that which occurs naturally as well as the change due to human activity. Although the depth of their knowledge may vary, most people today have at least heard of climate change, and most associate it with the recent and accelerating response to human activity". According to Hopkins (2013), the term "climate change" is vastly familiar within the general non-scientific public; however the perception or understanding of its materialisation or processes is varied, contrasting

and multifaceted. This means that due to the complexities of unique geographical changes and prolonged timeframes of the system, there are many uncertainties and difficulties in gaining a universal understanding of the phenomenon (Weber & Stern, 2011).

1.2 Climate Change Education in the South African Context

Education (i.e. formal education, public awareness and training) was defined by the United Nations Conference of Environment and Development (UNICED) as being essential in promoting sustainable development and should be renowned as a process that allows the human race to grasp their fullest potential (UNICED, 1992: SECTION 36.3). Additionally UNICED highlight the importance of "basic education as a vital foundation for any environmental and development education and a critical part of learning" (UNICED, 1992: SECTION 36.3). According to the Basic Education Department in South Africa, one of its aims of the Schooling Curriculum is "to ensure that children acquire and apply knowledge and skills in ways that are meaningful to their own lives. In this regard, the curriculum promotes knowledge in local contexts, while being sensitive to global imperatives" (Basic Education Department SA, 2011). This statement stems from the National Curriculum Statement which highlights the knowledge, skills, and values worth learning in South African schools. Furthermore "it seeks to equip learners regardless of their socio-economic background, race, gender, physical or intellectual ability with knowledge, skills and values necessary for self-fulfilment and meaningful participation in society" (Basic Education Department SA, 2011).

Ofsted (2008) describes geography as an "interdisciplinary subject and its practical nature helps learners to understand change, conflict, risk management, appreciate diversity, promote sustainability, respect human rights, and key issues which impact their lives presently and which will affect their future". The South African high school geography curriculum as shown on Table 1 below details a number of topics that are a foundation for understanding the climate change concept, and illustrates that learners should have some knowledge on the climate. Additionally, the Life Sciences subject (Table 2) also contributes towards developing scientific thinking; its aims as a subject according to the Department of Basic Education "to include that of

increasing knowledge, engaging in scientific investigations through practical work and empowering learners to be able to apply the knowledge gained in their everyday lives" (Basic Education Department SA, 2011). Based on this, one could further probe to identify the extent to which students understand climate change and their perception of their influence on their environment (Mugambiwa & Dzomonda, 2018).

Table 1: Geography CAPS Curriculum Topics

GEOGRAPHY CAPS CURRICULUM TOPICS		
GRADE 10	**GRADE 11**	**GRADE 12**
The composition and structure of the atmosphere	Global air circulation, Africa's weather and climate	Climate and weather: cyclones, local climate
Plate tectonics, folding, faulting, volcanoes and earthquakes	Rocks and landforms, slopes, mass movements	Geomorphology: drainage systems and fluvial processes
Population: structure, growth, and movement	Development: differences, issues, and opportunities	Rural and urban settlement
Water resources: Water in the world: oceans, flooding, water management	Resources and sustainability: soil, energy	Economic geography of South Africa:

Source:https://www.education.gov.za/Portals/0/CD/National%20Curriculum%20Statements%20and%20Vocational/CAPS%20FET%20_%20GEOGRAPHY%20_%20GR%2010-12%20_%20WEB_C9A9.pdf?ver=2015-01-27-154144-177

Table 2: Life Sciences CAPS Curriculum Topics

LIFE SCIENCES CAPS CURRICULUM TOPICS		
GRADE 10	**GRADE 11**	**GRADE 12**
❖ Chemistry of Life • Inorganic and Organic Compounds • Cell – unit of life • Cell Division • Plant and Animal Tissues	❖	❖ DNA code of life ❖ RNA and protein synthesis Meiosis
❖ Support and Transport systems in plants ❖ Support systems in animals ❖ Transport systems in mammals	❖ Energy transformations to support life: photosynthesis ❖ Animal nutrition ❖ Energy transformations: respiration ❖ Gas exchange Excretion	❖ Reproduction in vertebrates ❖ Human reproduction ❖ Nervous system ❖ Senses ❖ Endocrine system Homeostasis

❖ Biodiversity and classification ❖ History of Life on Earth	❖ Biodiversity – Classification of microorganism ❖ Biodiversity – plants ❖ Reproduction – plants Biodiversity - animals	❖ Darwinism and Natural Selection ❖ Human evolution
❖ Biosphere to ecosystems	❖ Population ecology ❖ Human impact on environment: current crises	❖ Human impact on the environment: current crisis

https://www.sahistory.org.za/archive/caps-grades-10-12-life-sciences Accessed: (03/07/21)

1.3 Climate Change Education for Girls and Women

An observation by Kwauk and Braga (2017) highlights how women and girls at a higher risk during climate change disasters as they are physically more vulnerable, thus most of the deaths from these disasters are of women and girls. Their exclusion from taking part in decision making at a household and community level excludes them from acquiring much needed survival information, skills and resources (Kwauk & Braga, 2017). Additionally they note how educating girls and women can presents a very powerful tool towards developing climate change mitigation measures; this is attributed to data suggesting a strong link between an average amount of schooling a girl child receives in their country in relation to that countries notch on indexes quantifying susceptibility to disasters related to climate change (Kwauk & Braga, 2017). South Africa has a constitution where education access is a right of every child and so this opens up opportunities for the girl child to access education and be better equipped in their response to climate change impacts.

1.4 Scientific Response

According to Ziervogel et al. (2014) South Africa possesses the most advanced scientific research, observation and climate modelling programme on the African continent with a number of its researchers partaking and leading in international global-change research programmes and scientific bodies. It is essential to gain insight into how the future leaders of our country (i.e. our youth of today) understand climate change and see human activities as a contributor to this phenomenon. Varied understanding exists about climate change and this is due to the fact that it is both a physical and social phenomenon (Hopkins, 2013). She explains the physical aspect of climate change as representing the physical characteristics such as climate related hazards, like droughts, floods, storms and the measuring and quantifying of these on

a local, regional, and global scale. Hopkins (2013) notes how this thinking has shifted due to interest from non-scientific communities and thus new socially constructed perceptions of climate change emerged. In his study Adge (1999) addresses what he terms social vulnerability to climate change emphasising its social dimension, this focuses on climate change impacts, stressors and processes required for social adaptation to these. South Africa, similar to the majority of African, Latin American and Asian countries, is extremely susceptible to climate change due to a number of various stressors (Anyanwu, *et al.*, 2015). These stressors include the "reality that the majority of its population lives in abject poverty, food insecurity, biodiversity degradation, and killer diseases, such as tuberculosis and human immunodeficiency virus infection and acquired immune deficiency syndrome (HIV/AIDS)" (Ziervogel, et al., 2014).

Additionally Fussel (2007) elucidates that "the scientific use of 'vulnerability' has its roots in geography and natural hazards research but this term is now a central concept in a variety of other research contexts such as ecology, public health, poverty and development, secure livelihoods and famine, sustainability science, land change, and climate impacts and adaptation" (Fussel, 2007). Africa is observed as being exposed to "extensive vulnerability to the threats of climate change due to its high dependence on climate-sensitive economic practices such as agriculture and its inadequate resources to react to these threats socially, financially and technologically" (Akrofi, *et al*., 2019). Furthermore in spite of the rapid changing weather patterns, they observed how "awareness levels are extremely low in Africa with the proportion of people who have never heard about climate change reaching two-thirds of the adult populations in South Africa and Nigeria" (Akrofi, *et al*., 2019). Wisner (2010) also points us toward climate change and its grave consequence on cultural transmission, this author shows that in rural communities, minority language groups were forced to move due to climate change impacts and some relocate to find work in cities as agricultural practices are largely affected (Wisner, 2010). Relocation of communities by large corporations for the purpose of harvesting natural resources disperses communities which causes cultural and traditional disruptions (Wisner, 2010).

Disruption of livelihoods puts the youth in a vulnerable position thus their perceptions are a crucial element in developing future mitigation ideas and policy formulation. A study conducted at Delhi University showed that the youth represented by students of Delhi University were familiar with climate change but turned a blind eye towards their individual carbon emission contributions (Jolli *et al*., 2015). Studying the youths' perceptions aids in including the youth as key stakeholders and improving social mobilisation for climate change action (Ferragamo *et al*., 2020). According to Ronald et al. (2017) schools offer an ideal environment for the promotion of positive environmental mind-set and conduct towards climate change. This also influences their knowledge, skills and attitudes towards this phenomenon and geography education contributes immensely in this aspect (Ronald, *et al*., 2017).

2. LITERATURE REVIEW

The earth's natural climate, according to Karl and Trenberth (2003), is made habitable due to its proximity to the sun and the natural climate controls of its atmosphere such as the ozone layer, clouds, and trees absorbing carbon dioxide and converting it to oxygen. They note how various human impacts have altered and acceded this natural balance of the earth's climate control thus the main contributing factor of climate change is human-induced. Furthermore they highlight how these human induced activities include energy use such as burning fossil fuels; land use changes and urbanisation contribute towards the increased warming up of the earth's climate (Karl & Trenberth, 2003). Ongoro and Ongara (2012) note how climate change has grown to become of grave concern both nationally and internationally and that it has accelerated within the past thirty years thus impacting on resource allocation. The catastrophic dimensions associated with it such as floods, droughts, and hurricanes have also been accelerated leaving communities vulnerable in a number of ways (Ongoro & Ogara, 2012).

Corner et al. (2015) alerts us to the fact that, even though young people will be the ones most affected by climate change, often their voices are not heard on platforms attempting to tackle this issue (Corner, *et al*., 2015). According to Braun (2018), "since the younger generation will be the one to actively design the world`s future it seems logical to address children and young adults when trying to evoke a more

environmental friendly lifestyle" (Braun, 2018). Ojala and Lakew (2017) highlight that focusing on the youth is of great importance as they represent the future leaders, decision makers, and future researchers and influencers. Hence it is suggested that "environmental education should aim at fostering a sustainable shift of attitudes towards active environmental stewardship" (Braun, 2018). Consideration of the youths' climate change concern could be a fundamental approach for constructing climate change supportive citizenry as the youth are "unlike adults" in that they are less likely to fall into ideological divergence based on political ideology and worldview factors that seem even more important than the influence of climate change knowledge (Stevenson, *et al.*, 2019).

A worldview is described as "a system of core beliefs, values, and attitudes concerning the nature and purpose of the universe and of humanity and how one should live their life and guide our perceptions, interpretations, and interactions with the world" (Woodard, 2021). Ideologies (including political) are explained by Denzau and North (1994/2000) as being "the shared framework of mental models that groups of individuals possess that provide both an interpretation of the environment and a prescription as to how that environment should be structured" (Denzau & North, 1994/2000). The statement by Stevenson et al. (1904/200) suggests that youth by virtue of their young age would possess limited exposure to these varying worldviews and would thus be perceived as still being able to make neutral and less biased future decisions. Hence by studying the youth's awareness of climate change we will be able to obtain an indication of not only their level of understanding but also their attitudes towards environmental impacts.

Masud et al. (2015) showed how individuals observe their surrounding environment is greatly affected by the significant dimensions of attitudes and that a positive attitude has a potential to evoke positive environmental preservation roles (Masud, *et al*., 2015). Furthermore their paper suggests that "people are more likely to accept pro-environmental behaviours only if they have sufficient understanding of the adverse impacts of no action" hence highlighting the importance of awareness (Masud, et al., 2015). Thus the proposed study aims to focus on measuring the youth's climate change awareness, knowledge gaps and their understanding of who or what they feel have the greater influence on the environment.

A study conducted by Akrofi et al. (2019) surveyed students in various universities across the African continent revealed that students did not associate themselves as being contributors towards environmental negative impacts; they did not view their daily decisions as having potential impacts. This, they deduced, "implied that students might be contributing more to the problem of global warming and climate change than they thought thus they will not be able to educate others about how such factors contribute to climate change or how climate change affects essential issues such as conflicts, job security and gender inequalities which are pertinent issues in Africa" (Akrofi, *et al*., 2019). Hence Braun (2018) suggests that it is important to inspire an insightful awareness on anthrocentric environmental impacts as these also play a crucial role in the increase of environmental threats (Braun, 2018). As Masud et al. (2015) puts it, "a healthy future environment requires greater public understanding of environmental problems and practical steps towards pro-environmental behaviour" (Pg. 2-3).

According to Stevenson et al. (2019) it is crucial that we find ways of understanding how to instil a sense of care or what they refer to as "Climate change concern" within the youth, as this could reinforce attempts to unite future generations in their efforts to combating climate change impacts (Stevenson, *et al*., 2019). Furthermore from their study results they observed that climate change education directed to the youth proved to be a more promising venture than those directed to adults and that there is a great need for development of climate change education in order to evoke climate change concern in youth so they will grow with it into adulthood (Stevenson, *et al*., 2019).

It is said that "young people are an essential group to include in efforts to combat what causes climate change" (Ojala & Lakew, 2017). This is also reflected in the United Nations 17 Sustainable Development Goals specifically goal number 13; which speaks to taking urgent action to combat climate change and its impacts. Within this goal are specific targets one of which focusses specifically on "improving education, awareness raising and human and institutional capacity on climate change mitigation, adaptation, impact reduction and early warning" (United Nations, 2015). Environmental awareness is explained as "the growth and development of consciousness, understanding, and perception toward the biophysical environment and its problems

including human interactions and effects, in other words, thinking “ecologically” or in terms of an ecological consciousness” (North, 1997).This research is inspired by a study conducted by Bord et al. (1998), where wide-ranging information was collected focussing on the U.S. public’s beliefs, attitudes, and behavioural intentions about global warming. Their belief was that enhanced understanding of public perceptions and knowledge about global warming can contribute to an informed scientific and policy dialogue of climate change because those responses can relax or intensify the impact (Bord, *et al*., 1998).

This is further recognised by Gbetibouo (2009) when stating that adaptation is extensively acknowledged as a vital part of any policy response to climate change. Additionally they suggest that it is in the best interest for policy makers to know what the public wants, to enable them to design policies that will be supported or at least acceptable (Bord, *et al*., 1998). They noted also how the outcomes proved to be somewhat disturbing as it uncovered that when global warming questions are incorporated in lists of other environmental and social problems, global warming tends to reflect the least concern and support in relation to the other issues such as poverty eradication and ensuring food security. Lineman et al. (2015), describes global warming as a prolonged pattern of rising average of global temperatures; climate change however is explained as changes in temperature globally or across regions that is accredited to increased carbon emissions from amplified fossil fuel usage from the periods between mid to late 20th century onwards.

Global warming is defined as “the long-term trend of increasing average global temperatures; alternatively, climate change is defined as a change in global or regional climate patterns, in particular a change apparent from the mid to late 20th century onwards and attributed to the increased levels of atmospheric carbon dioxide arising from the use of fossil fuels” (Lineman *et al*., 2015). Although there has been considerable scientific consensus, Flusberg *et al*. (2017) observed how millions of Americans fail to view climate change as a pressing threat thus this raised concern over how this disconnect between science and public opinion could be addressed. It is timely that a study be conducted within the South African context such that light is shed on the youth’s levels of awareness and knowledge on climate change.

3. PROBLEM STATEMENT

According to another study conducted in South Africa, climate change is of great significance however it is not universally understood and the question of “what exactly is climate change?” still proves challenging to answer and ends up coming across as a mere idea, perception or even just theory (Benoit, n.d.). The problem with this reality is that it perpetuates a knowledge gap and differing schools of thoughts between scientists, scholars, politicians, activists and policy makers, which in effect slows down progress in policy formulation and ultimately implementation. This study sheds light on the extent to which there is variation in the youths’ knowledge and awareness of climate change. This, in turn, will “give the researcher (and indeed the recipients of this research) a glimpse into the future direction of climate change policy” (Benoit, n.d.).

Climate change has attracted a lot of attention within various countries and many of these have come together for various United Nations Summits showing unity in attempting to tackle this issue. These have evolved to become “global political events where an enormous amount of knowledge production, economic lobbying, civic activism, and bargaining gravitate around potentially consequential political decision making” (Kunelius & Eide, 2012). They further note the various international bodies that represent this “united effort” such as the United Nation's Intergovernmental Panel for Climate Change (IPCC) or the United Nations Framework Convention on Climate Change (UNFCC) and its Conferences of Participants (COPs) since 1995. These significant initiatives however fail to take into consideration the voice of our youth; thus the youths’ perceptions are indirectly silenced. A statement by 21 year old Marinel Ubaldo a climate change activist in the Philippines highlights this clearly: “…the voices of youth are not being heard because of a lack of opportunity. While it’s often said that youth are the hope of the nation, how can we be a hope if the nation doesn’t give us the opportunity to speak out on the issues that matters to us? Because climate change is impacting on our education, health and safety, we have a right to be heard.” (Morrissey, *et al*., 2016). My study set out to provide access to the youths’ perceptions (knowledge and awareness) of climate change and their contributions towards this phenomenon.

4. STUDY RATIONAL

According to Karl and Trenberth (2003), the one thing that all nations have in common is the atmosphere and that it is affected by many triggers such as emissions and changes in the earth's surface or beneath it. They make note of how an experiment involving human balloon flights around the world revealed that it takes a week for air to move from a specific location to travel halfway around the earth (Karl & Trenberth, 2003). Thus they concluded that this atmospheric movement is indicative of the potential for emissions to affect the atmosphere globally and ultimately contribute to global climate changes (Karl and Trenberth, 2003). As a professional Environmentalist I have been very intrigued by the general perceptions from family, friends and colleagues about what this field of environmental management entails. Anecdotally the older generation seem to perceive environmentalists as gardeners while the younger generation thinks along the lines of safety management. When I realised that even my employer had very little understanding of what is required of me as an employee; including having to draw-up my own job description as human resources and management did not understand the tasks involved, this triggered an interest to measure just how much public understanding existed amongst others in society, especially in terms of the youth i.e. the potential workforce of this area. The youth are our future leaders and with such a large array of possible career paths; it is important to assess how the youth perceive climate change and their impact on the environment. Climate change affects us globally and is a topic that requires unity in attempting to tackle it; and so this evoked questions of how much understanding there was surrounding this phenomenon.

5. PURPOSE OF STUDY

The focus for the study was on exploring the perceptions (knowledge and awareness) of youth towards climate change within the African context. The research was conducted through a survey questionnaire aimed at acquiring this information from first-year students registered with the School of Animal, Plant and Environmental Sciences, Wits University, thus their perceptions would be based on their level of knowledge they gained in high school and in their general life experience before

entering university. According to Anyanwu et al. (2015), the “South African National Climate Change Response Policy White Paper advocates teaching the concept of climate change and related issues at all levels of formal education” (Department of Environmental Affairs, Republic of South Africa, 2011). This they highlight is achieved by the South African basic education system through offering Geography as a subject in their curriculum (Table 1) throughout the various grades (Anyanwu, *et al*., 2015). They note how geography as a subject offers increased prospects into understanding climate change concepts due to its focus on place, spatial processes, spatial distribution, society, and environment (Anyanwu, *et al*., 2015). Geographical studies in lower grades, i.e. between grades 4 to 9, is taught as a sub-discipline of Social Sciences and as a specific subject from grade 10 to grade 12 (Department of Basic Education (DBE), Republic of South Africa (RSA), 2011) cited by (Anyanwu, *et al*., 2015). In the higher grades, i.e. between grades 10-12, concepts on climate change are incorporated into the Life Sciences Curriculum, this subject involves the systematic study of life in the changing natural and human-made environment (Basic Education Department SA, 2011).This move by the South African Department of Education thus supports Roth (1992) in highlighting that “for the vast majority of students not interested in scientific careers, some exposure to science had long been thought necessary both in high school and college, based on the theory that a discipline so prominent in human affairs deserve to be part of the general education of all students" (Roth, 1992).

In regard to the above mentioned observation it is plausible that first-year students enrolled within the School of Animal, Plant and Environmental Sciences have been exposed to some degree of information regarding climate change within their schooling curriculum if they studied subjects such as Geography and Life Sciences. This study seeks to measure the first-year biology students’ understanding and perceptions of climate change at the start of their academic year. The diversity of students come from various backgrounds and contexts such as rural or urban and range from well-resourced and poorly-resourced schools. This observation can shed light on how teaching from different contexts and varying resources impacts knowledge transfer to students. Shealy et al. (2019) explain how climate change education in school provides a useful platform in correcting conceptions and assist students in developing their own convictions around this subject (Shealy, *et al*., 2019). Thus schools are regarded from all indications as the ideal place to initiate climate

change education, where children can learn and develop skills to manage their own environments (Amanchukwu *et al*., 2015). According to Braun, 2018 there are four levels between nature experience and environmental behaviour with differing connections outlined in 5.1.1 to 5.1.4.

5.1 Model Showing the Connection between Awareness, Experience, and Behaviour

Janssen (1988) devised a representation which highlights the significance of nature experiences as a basis for cognitive environmental appreciation, nature awareness and the inspiration for proactive environmental behaviour (see Figure 1) (Braun, 2018). Thus by interviewing first-year university students from varying geographical contexts the study may reveal if exposure and nature experiences are indeed linked to interest and appreciation of the environment.

5.1.1 Experience Nature

Soga and Gaston (2016) refer to a phenomenon they term as the “loss of experience”, this shift is not simply limited to a loss of engagement with pristine areas or wilderness environments, but also involves changes in a wide diversity of activities and experiences, including time spent in urban greenspaces and observing urban wildlife (Soga & Gaston, 2016). A number of studies have eluded towards the idea of humans having lost their connection with nature as the reason for their disregard for the environment. This is believed to possibly have impacts in consequent environmental values, attitudes, and behaviour (Vining, *et al*., 2008). With participants in my study coming from varied geographical contexts we could determine if their knowledge and awareness of climate change is linked to geographical contexts. Furthermore they add that by unlocking this link it may lead towards gaining “a better awareness of the importance of people's perceptions of themselves in nature and how that perception relates to general human-environment interactions as well as management and policy” (Vining, *et al*., 2008). According to Frantz and Mayer (2014) there has been great research attesting to the idea that having a connection to something or someone induces defensive and selfless behaviour thus connectedness to nature is viewed as a significant predictor of environmentally conscientious conduct. The model illustrated

in figure 1 (below) was formulated to highlight the importance of nature experiences as a basis for cognitive environmental perception, nature awareness and the motivation for proactive environmental behaviour (Braun, 2018).

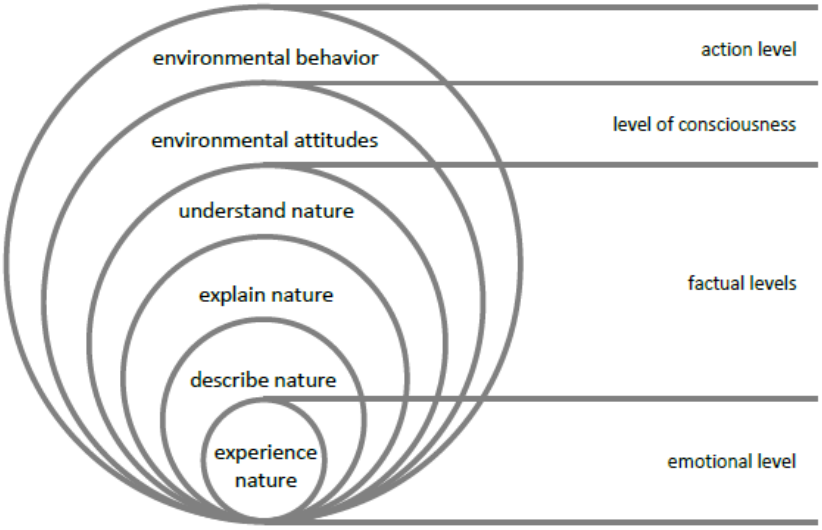

Figure 1: Connection between nature experience and environmental behaviour. Source: Janssen (1988) cited by Braun, (2018).

In the case of my respondents their experience of nature could refer to their immediate surroundings and their daily experience of nature, this could also mean getting to experience nature through environmental education within their school curriculum. This in turn evokes certain emotional feelings towards nature relating to their experience of it, hence it is the emotional level as indicated by figure 1.

5.1.2 Describing, Explaining and Understand Nature

A person needs to “experience” nature to be able to reach a level of being able to give factual descriptions, explanations and understanding of nature from their experienced perspective as indicated by figure 1. As described previously, respondents from my study should be able to manoeuvre these factual levels from their daily experience of nature or learnings from school.

5.1.3 Environmental Attitudes

Attitudes stems from experience, involvement or awareness of something or phenomenon. My study respondents are proposed to be able to formulate attitudes from their lived experience of nature or lessons learnt at school about nature hence here the individual is said to have reached a level of consciousness as describe on figure 1.

5.1.4 Environmental Behaviour

This is described as the action level and here the individual is able to act according to their experience of nature. My study respondents can thus develop some behaviours towards nature according to their physical experience of it and experience through lessons learnt at school. This indicates the need for exposure to nature and that "loss of interaction with nature not only diminishes a wide range of benefits relating to health and well-being, but also discourages positive emotions, attitudes, and behaviour with regard to the environment, implying a cycle of disaffection toward nature" (Soga & Gaston, 2016).

6. AIM AND OBJECTIVES

The aim of this study was to investigate the level of awareness and knowledge of climate change held by our future leaders, i.e. the youth of South Africa. Due to set time frames the study area and sample size of the study were limited to participants from within the School of Animal, Plant and Environmental Sciences, Faculty of Science, University of Witwatersrand. This was achieved by exploring their level of understanding of this phenomenon and their knowledge and awareness towards issues related to climate change and their responsibility towards the environment.

Objectives:

- To examine the first-year biology students' awareness and knowledge of climate change at the start of their university studies.
- To identify the first-year biology students' views on their impact on their environment.

7. RESEARCH QUESTION

What is the youths' awareness and knowledge of climate change and their impact on their environment?

8. HYPOTHESIS

The hypothesis is that early introduction to climate change education through a comprehensive education is key into developing climate change agency. The schooling system is viewed as an ideal medium to prepare each generation for post-secondary education, careers, and citizenship and prepare them to be able to take on their responsibilities to address climate change impacts (Simmons, 2011). This study hypothesises that the university students' who are participants of this research study, having gone through the South African Schooling Curriculum which incorporates environmental education, will have some degree of knowledge on climate and their impact on the environment. This is purely a qualitative survey and thematic analysis will be used to examine data and report on findings.

9. THEORETICAL FRAMEWORK

Social constructionism began just over 30 years ago as a way to come to terms with the nature of reality, it has its origins in sociology and has been linked with the post-modern era in qualitative research (Andrews, 2012). The work of Berger and Luckmann (1966) is acknowledged in the now classic book "The Social Construction of Reality" as an important contributor towards the development of social constructionist theory (Burr, 2015). This theory recognises that there is an objective reality and is concerned with how knowledge is constructed and understood thus it has an epistemological rather than an ontological perspective (Andrews, 2012). Thus by virtue of this study looking at the participants' perspectives of climate change based on what they have learnt from school, their general knowledge, awareness and experience of the world, this research ultimately looks at their construction of their reality in terms of this phenomenon.

This study utilised the social constructionists theory, which according to Amanchukwu et al. (2015) suggest that environmental problems are, to some extent, socially constructed by groups of people. They further note that climate change (with degree of social construct) is one of the most multifaceted challenges impacting the world, contributing to the increased problems of ensuring food security and poverty reduction in the developing world (Amanchukwu, *et al*., 2015).The phenomenon, “is broadly viewed as substantial because of its impacts on society, economy and health of the communities” (Mugambiwa & Dzomonda, 2018). This indicates that the knowledge of university students’ regarding climate change is of vital importance because they contribute significantly to the advancement of varied communities in many respects (Amanchukwu, *et al*., 2015). It is noted that “at its best, social constructionism offers environmental ethics several invaluable tools, beginning with humility about our own ways of seeing and being in the world and awareness of alternatives to them” (Peterson, 1999). This study unlocked this element through exploring the participants’ knowledge and awareness based on their past education and their experiences gained from their varying geographical context. Furthermore he suggests that nature “lies forever beyond the borders of our linguistic universe that it does not talk back to us in a language we can easily understand, that we cannot gain knowledge of the nonhuman world easily or fully, however, that does not mean we cannot know it at all” (Peterson, 1999). Since this study aims to investigate the participants’ “perceptions”(knowledge and awareness) this investigation looks at the environment through each individual’s eyes, and thus based on personal experience as it has been suggested by Peterson (1999) that the environment speaks to us in varying ways and is not bounded by our diversities.

CHAPTER 2

2.1 MATERIALS AND METHODS

The study population comprise of the Wits University first-year students registered for the Introductory to Life Sciences course within the Faculty of Science, School of Animal, Plant and Environmental Sciences. The study utilised a qualitative approach and a descriptive design. Due to convenient access to respondents the study utilised convenience sampling. Etikan et al. (2016) explain that convenience sampling is a method used by researches to select a sample of respondents from a larger population and is a non-probability method. They describe non-probability sampling as "sampling whereby randomization is not important as it is selecting a sample from the population of interest" (Etikan, *et al*., 2016). They further highlight that a non-probability method is useful when working with a large population with limited time, resources and to report on a generalised aspect of the complete population thus convenience sampling would be ideal for the proposed study (Etikan, *et al*., 2016).

This study was adapted based on one conducted by Bord et al. (1998) where participants were asked about their goals and issues affecting their communities, where respondents answered questions about goals and comparative threat knowledge and awareness about climate change, social and political values, and of demographics. They elucidate how the purpose of their overall project was to develop and test a risk perception model for climate change. The order and framework of questions was carefully planned to allow for respondents to think contextually; they were asked to rate various goals, judgements of various social issues (violent crime, hazardous chemical wastes, the disease AIDS, air pollution, cancer, global warming, heart disease, water pollution, and automobile accidents) thus allowing for data to reveal their order of importance of these social and environmental issues and the standing of global warming with it (Bord, *et al*., 1998). The research survey by Bord et al. (1998) was adapted for my research within the South African context, and will be analysed qualitatively based on the type of questions asked, rather than providing a quantitative analysis of the data. Application to conduct research involving conducting a survey with participants was applied for from the Wits University Human Research Ethics Committee (Appendix 1); clearance was obtained (Appendix 2) with protocol

number HA2003 to conduct this study as it required communication with participants; this is to ensure that participants are aware of their rights and protected, also to ensure the study meets all requirements to achieve this. Participants were issued with and Information Sheet (Appendix 3) and the Consent Form (Appendix 4).

2.2 DATA COLLECTION

According to QuestionPro (2020) who specialise in the formulation of research questionnaires, “climate change awareness survey questions is a questionnaire to understand public perception about climate change and to identify key factors, challenges, and barriers to environmental and climate-conscious behaviour” (QuestionPro, 2020). Furthermore Question Pro, (2020) explain how these types of surveys assist in gaining perspective on the participant’s awareness and these also play a crucial role in policy formation within most democratic countries. Therefore in my study the questionnaire comprised of a number of sections each seeking to detect and measure perceptions towards climate change and not necessarily the participants plan to tackle the climate change phenomenon. Section one of the questionnaire comprised of close-ended questions covering demographic information to gain an understanding of the participants’ background. Section two probed the students’ perception of climate change; this was used to highlight their personal understanding of what climate change entails and how they became aware of it. Section three focused on measuring the participants’ ranking of potential climate change threats to society and their ranking of issues perceived to be of importance within their communities in comparison to climate change from their personal observations. The questionnaire has been provided on Appendix 5. It further seeks to find out if participants believed that climate change was a natural and/or human-induced phenomenon, and the risk of impacts it poses. It also looks at who or what they believed were the contributors to climate change. Data was interpreted on the Likert scale in relation to the responses to open-response questions on awareness and knowledge of climate change to determine whether there is an observable pattern or trend across these areas. This section had an open-ended question where participants were able to describe the impact of climate change to them personally.

Due to the break-out of the Corona Virus global pandemic we have been faced with having to find new ways of conducting research especially during lockdown. This study was conducted via online survey to ensure access to participants even during possible national shut-down and the survey questionnaire was distributed via the participants' official Wits University Student emails. An invitation was sent out to students on the learning management platform at the university via the administrator for the Introductory Life Sciences (ILS) course at the School of Animals, Plants and Environmental Sciences (AP&ES). The advantage with online distribution included the safety of the participants and the researcher by limiting physical contact. All ILS students (n=approximately 700) were invited into the study and although the call was sent out twice only 29 of the students from the School of AP&ES responded to the survey. The university administrator sent out an invite to ILS students on behalf of the researcher, this is protocol to protect the respondents personal contact details. This mode of distribution saved time as it allowed responses to be in digital format once collected. All participants were informed that their participation is purely on a voluntary basis. The participant information sheet and consent form were provided as the first page of the online survey. The study was conducted at the start of the 2021 academic year; prior to the students' exposure to Wits academic programme thus allowing for a true indication of the participants understanding of climate change before being influenced by the university curriculum.

2.3. DATA ANALYSIS

This is a qualitative study. The demographic data was used to provide the background context for the participant sample who had responded to my survey. According to Braun and Clarke (2006) thematic analysis is used to examine the realities of people, and acknowledges the way in which individuals construct meaning. Thematic analysis was used in my study to analyse the patterns between the background demographic data (i.e. type of high school attended, subject choice for geography and/or life sciences, career choice, career interest) in relation to the students' awareness and knowledge on climate change and reflections of personal and youth impact on the climate. These factors were posed as either Likert-scale questions or open-ended questions, as such on appendix 5. I coded the responses to the open-ended questions, and analysed the responses to determine the patterns and themes which emerged

from my data. The coded data was then analysed according to trends that emerged. This comparative, qualitative analysis enabled me to determine any trends that emerged generally across all transcripts, and on the basis of the aspects listed above.

2.4 ETHICAL ASPECTS

Ethical research, according to Hay (2016) is characterised by researchers who behave with integrity and who act in ways that are just, beneficent and respectful. The two most crucial ethical issues as pointed out by Longhurst (2016) are confidentiality and anonymity; and that participants need to be assured that all data will be kept safe with controlled access. Participants also needed to be aware that participation is voluntary, and they can chose to withdraw from the research at any time without any explanation. It also constitutes sound research to provide participants with a summary of research findings once research is complete. Participants were provided with the information letter and content for the consent form on the first page of the online survey. Their submission of the completed survey was taken as their consent to participate in this study and their responses were treated confidentially, and identities (their names and the name of the organisation) remained anonymous. There was no form of compensation offered to any of the participants.

The University of Witwatersrand has pledged to abide by legally binding ethical standards such as those prescribed by the Singapore Statement 2010. These are set to ensure good ethical conduct by the researcher, ensure the use of non-harmful research methods, ensure researcher is unbiased, evade conflict of interest, protect research participants' confidentiality, ensure irresponsible conduct is addressed and ensuring research that is not harmful to societies and the environment. Thus this study was obligated to comply with these standards as the researcher is a registered student within the University of Witwatersrand. Compliance was achieved via the application process for acquiring ethical clearance from the Human Research Ethics Committee. The protocol number for this study is HA2003.

CHAPTER 3

3.1. RESULTS AND DISCUSSIONS

3.1.1 Youth Enrolled for Biological Sciences

As articulated by former President of South Africa, Nelson Mandela - “Youth are valued possessions of the nation. Without them there can be no reconstruction and development programme. Without them there is no future. Their needs are immense and urgent.” Nelson Mandela (May, 1999) cited by (Oseifuah, 2010). He further highlights how the term “youth” is understood and defined in varying ways between different countries; however the South African definition according to the National Youth Act of 1996 and the National Youth Policy of 2009-2014 incorporates any persons in the age group 14-34 years (Oseifuah, 2010). During the United Nations International Youth Year held in 1985 it was proposed that the age bracket representing youth would be 15-24 years; however Kouwenberg and Butter (2011) suggest that this would be a very narrow representation of youth in an African context and Howana (2005) further elucidates this narrow representation by highlighting the contrast between the care-free, secure and sheltered notion of childhood from a Western perspective with that of the African context where children often share or take on responsibilities of meeting daily needs such as getting food, income and taking care of siblings and even heading households at a much younger age that 15 years (Honwana & de Boeck, 2005).

In line with the National Youth Act of 1996, my current study includes investigating the impact of the high school syllabus on students’ views of climate change within the age group 18-45, it seemed appropriate to sample from this age range within the undergraduate university. By this stage students would have experienced the high school curriculum to its full extent within the subject area of Life Sciences. Results reflect a significant percentage of 97 percent of respondents are aged between 18-25 years with the remaining 3 percent aged between 26-45 years; thus a limitation in the selection provided to participants was noted. This limitation is noted because it does not include the entire age range as suggested by Oseifuah, (2010) which indicated a wider age range for youth within the South African context, this study included a higher upper range for age of participants. It could be valuable to have the following age

ranges 14-35 and this can be taken into consideration in future research within the SA context.

3.1.2 Youth Access to Higher education

A study conducted by Walker and Mkhwanazi (2015) highlights the challenges faced by marginalised youth residing in informal settlements who want to access higher education in South Africa. Their study revealed that the young people of Orange Farm Informal Settlement have aspirations of accessing higher education but were unsure of how to acquire information to do so as they are geographically isolated with limited information and resources to attain these ambitions (Walker & Mkhwanazi, 2015). They formulated an illustration (see figure 2 below) to indicate how limited access to resources can hinder future aspirations and ability to make meaningful contributions towards one's own life. This hindrance also reduces the ability to contribute towards societal issues, policy formulation that ensure proper governance that may include issues of addressing climate change (Walker & Mkhwanazi, 2015). The missed opportunity to access higher education does not only reduce their chance of a better economic future but could cause missed opportunities to study climate change further, evoke further interest within the field, increase numbers of climate change scientist, increase research outputs, contribute towards formulation of mitigations and sustainability policies. With my study showing a similar trend in reduced numbers of respondents from rural areas and small towns (Tables 3 and 4); it is possible that based on limited access to information on how to register at an institution for higher learning, that the smaller populace of youth whom can access qualifications within Biological Studies does not include the full range of students from these areas. Additionally their limitation towards accessing higher education and significant capabilities in the future represents a missed opportunity for institutions to produce future academics from diverse backgrounds with potential to impact future decisions and policies in the area of climate change and the environment.

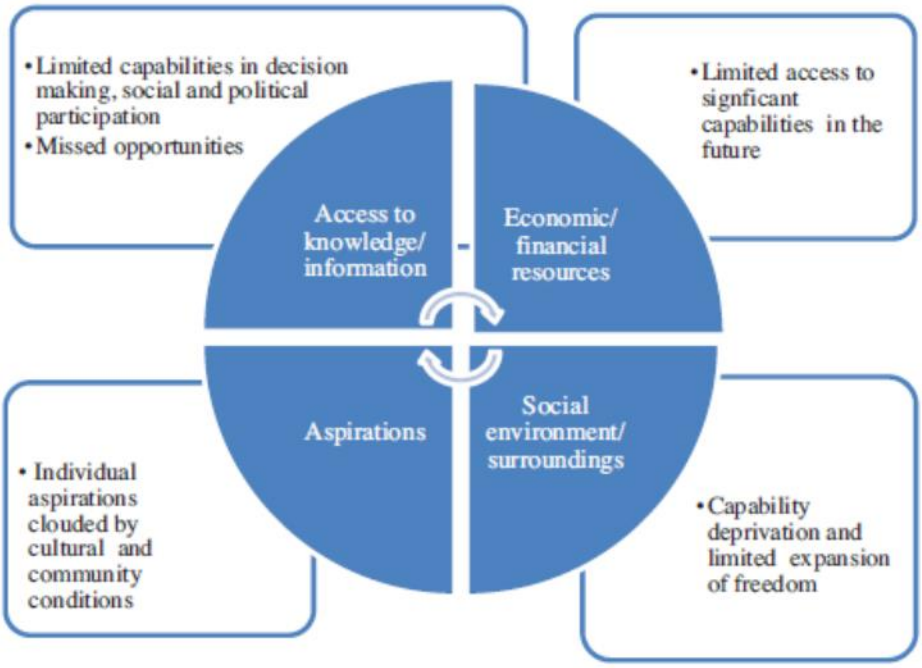

Figure 2: Capability Deprivation versus Human Development.

https://doi.org/10.1016/j.ijedudev.2014.11.010 (Walker & Mkhwanazi, 2015)(Accessed: 06/06/21)

3.1.3 Climate Change and Geographical Context

Climate change is experienced in varying degrees across geographical contexts; this is also observed across the different provinces within South Africa. Having participants representing 6 out of the 9 provinces gives a fair representation of these experiences and observations (Table 4). In their study Ojomo et al. (2015) noted how due to the varied climate across Nigeria, personal experience seemed to play a role in the respondents knowledge and attitudes regarding climate (Ojomo, *et al*., 2015). According to Lorenzoni et al. (2006), people view and understand climate change relative to their daily practises. Their varying backgrounds in terms of area of resident allows for unique experiences, relatability, and perspectives to climate change.

According to Ruiters (2001), socio-spatial differentiation racism is also produced through the built environment; the apartheid regime was directed to place non-white races into areas that are poverty ridden and people are more dependent on natural resources thus with climate change these resources are reduced and directly affect

the wellbeing of these communities such as rural agricultural dependant areas. He further notes how even though these segregation lines have become slightly blurred over the democratic years these inequalities continue to deepen (Ruiters, 2001). Data from my study reflected that very few respondents were from rural and small towns, while majority come from cities, suburbs, and townships (see Table 3 below). Looking at provincial representation of respondents (see Table 4 below) also revealed a larger percentage of 69 percent were from Gauteng, 14 percent from KwaZulu Natal, 7 percent from the Eastern Cape, 4 percent from the Free State, and 3 percent from Mpumalanga and the Western Cape; there was no representation from Limpopo, Northern Cape and North West Provinces. This may be indicative of varying levels of resources to accessing the questionnaire online and entrance to institutions of higher education.

Table 3: Respondents Area of Residence

AREA OF RESIDENCE	PERCENTAGE
Suburb	41
Township	24
City	17
Small Town	14
Rural	4

Table 4: Respondents Province Representation

PROVINCE	PERCENTAGE
Gauteng	69
KwaZulu Natal	14
Eastern Cape	7
Free State	4
Western Cape	3
Mpumalanga	3
Northern Cape	0
North West	0
Limpopo	0

3.1.4 Environmental Education

The respondents were further requested to locate their school and place of residence with the aim to gain insight into their surroundings and thus their geographical exposure. Respondents were asked if they had studied geography or life sciences at school as the curriculum for both these subjects in high school was observed to contain content on the environment as well (figures 3 and 4). Learning geography or life sciences would possibly be a different experience for a student in rural context compared to one from an urban context in terms of learning from their interactions within their local environments; and so because geography incorporates understating spatial elements their exposure to these environments may be crucial to acquiring a better understanding of the subject.

Figures 3 and 4: Respondents who studied Geography and Life Sciences at school

The South African schooling curriculum has incorporated climate change into their life sciences and geography subject choices (Tables 1 and 2), this ensures that even if one opts for only one of the subjects they will be introduced to the content. Furthermore this highlights the views of Stevenson et al. (2017) that climate change is both a multifaceted scientific and social phenomenon (Stevenson, *et al*., 2017). This is attributed to climate change being an outcome of negative impacts and triggers concerning a number of interlinked ecological or scientific systems, which ultimately affects human beings as they are dependent on natural resources. Additionally they define climate change as being "characterised by uncertain and context-specific knowledge" and thus requires teachers to participate in increasing their own knowledge base while educating students (Stevenson, *et al*., 2017). The Geography

and Life Sciences curricular offered in schools is in line with these goals and these are the percentages of students who have selected these subjects and are therefore exposed to this syllabus; 83% and 41% respondents having studied Life Sciences and Geography respectively, see figures 3 and 4. Anderson (2012) describes education as "an untapped opportunity to combat climate change", they elucidate how climate change education encompassing environmental and social issues, disaster risk mitigation, promotes ecologically sound consumption and sets out the path towards achieving sustainable development (Anderson, 2012). This is further supported by Nkoana (2020). She highlights the importance of climate change education as a tool to raising awareness which is an essential component in gaining knowledge that will evoke a decision making process towards mitigation and adaptation measures (Nkoana, 2020). Considering that the majority of my sample have been exposed to the topics on climate change at high school, this cohort was considered appropriate for this study.

3.1.5 Climate Change Awareness

3.1.5.1 School Curriculum and Climate Change Awareness

Based on the number of students who had done Life Sciences and/or Geography at school, it is unsurprising that 93% of the respondents noted they were aware of climate change and an another 66% noted they had learned about it at school; this they elaborated had been supplemented by other means of learning platforms too. Some of the respondents were able to recall even the grades they were in when they became aware of climate change:

"Yes I think I started learning about it in grade 4"

"I was first introduced to climate change in grade 6 (2014), when we had to do a project on environmental responsibility. This is where I first realised the seriousness of climate change"

"Yes, grade 4 geography"

"Yes, I was taught about Climate change back in High school when I was in grade 9".

These responses clearly suggest that the school curriculum has incorporated issues related to the environment from the primary through to the secondary grades. Therefore, it seems that the school curricular is indeed a vital instrument in raising awareness and contributing towards increased knowledge base towards learners. Ors (2012) describes environmental education as learning that involves enhancing environmental awareness at all community levels, with the expectation that by doing so this will develop individual perception and evoke pro-environmental behaviours and active participation. This he notes is in line with the goals of the world's first intergovernmental conference on environmental education, this conference afforded the formation of the Tbilis Declaration of 1977. The aim of the Declaration includes "adopting a clear awareness of, and concern about, economic, social, political, and ecological interdependence in urban and rural areas; To provide every person with opportunities to acquire the knowledge, values, attitudes, commitment, and skills needed to protect and improve the environment; to create new patterns of behaviour of individuals, groups, and society as a whole towards the environment" (The Global Development Research Center (GDRC), 1977) .

3.1.5.2 Curriculum Inspired Career Path

55% respondents noted that their school curriculum had a positive impact in stimulating their interest towards their future career of choice; thus proving the importance of incorporating issues of global interest such as climate change into the school curriculum in increasing awareness. Their responses to the question if their school curriculum inspire their career choice interest included:

"Yes. My interest in life sciences and how the human body and other organisms operate in junction with their environments intrigued me"

"Yes I was doing science in school and I fell in love with it then decided to choose a science related career which I am doing now".

This observation was then linked to the responses on their ideal career path; their responses revealed that their career choices were varied and unique, and included a diversity of jobs which consisted of the medical field, biological sciences, environmental sciences, actuarial science, agricultural sciences, geological and

geospatial sciences. This will thus contribute towards future professionals in varying fields with an awareness of climate change; through this awareness it can inspire environmentally sustainable decisions and policy formulations in their various areas of speciality. Thus it has been suggested that “tackling complex social-ecological problems need sustained interdisciplinary engagements across multiple disciplines” (Elser *et al*. 2016). Therefore since academic offerings at institutions of higher learning still continue to reflect disciplinary silos; high school curriculum can introduce climate change awareness before students enter the various disciplinary silos (Esler, *et al*., 2016).

3.1.5.3 Education of Women in the Context of Climate Change

The data reflects that there is a balance in the representation of different genders and could indicate that both genders are motivated to study Life Sciences further when they enter into higher education, this is indicative of the possibility of future pro-environmentally sensitive thinkers. Jegede (2017) elucidated how even though the United Nations (UN) recognise the lop-sided effects climate change has on women (as explained below) and the girl child stemming from gendered household roles yet the UN still fails to address the importance of education as a tool in increasing awareness, encourage adaptation and mitigation. Gendered roles are explained as allocation of household activities being linked to gender; where “girls, for example, have been shown to perform traditionally feminine household tasks” (McHale, *et al*., 1999). Furthermore he notes that the UN Commission should be leading its signatories such as South Africa in developing implements such as climate change education that can cultivate “a gender focused climate change education in South Africa” (Jegede, 2017). South Africa has attempted to address this by including climate change education in their schooling curriculum however there was no evidence of it addressing a more gender focus approach based on the Life Sciences and Geography curriculum (Tables 1 and 2).

An International Conference of the Parties (COP) held in 2017 saw an introduction of the gendered dynamics of climate change through activism and the birth of the slogan “No climate justice without gender justice” (Sultana, 2014). The increased temperatures and flooding affect crop production and gendered roles as caregivers

places women on a vulnerable position as nurtures during and after climate change related disasters; they are often faced with taking care of the injured, recovering what can be salvaged from the debris, taking care of the young and elderly and even lose their lives while attempting to save children, possessions and facing displacement (Sultana, 2014). Additionally they are often faced with a challenge in the long relief queues as they attempt to get food and basic need items while also trying to manage children in such circumstances (Sultana, 2014).

A study conducted by Agarwal (2000) on gender representation within environmental management professions suggest that women are often side-lined and inhibited in their participation; this is further brought to light by Westberg and Powel, (2015) pointing out how gendered predominant standards within Swedish environmental agencies side-line women by not allocating them to traditional scientific expert, high status roles but are appointed as administrators with lower status tasks (Westberg & Powell, 2015). The present study received a 52 percent female representation; this good representation of gender reflects that among the youth enrolled for Life Science Degrees in South Africa there is great prospect towards changing this narrative of side-lining women as scientists within biology-based disciplines. My data also shows that there is a good representation of this gender who are being educated on climate change issues.

3.1.5.7 Race in the Context of Biological Studies

The data reflects a fair percentage representation from each race matches the demographics of our country and also representative of the percentage of students from each race which forms the ILS cohort of students registered for biology. According to Musavengane and Leonard (2019) South Africa's conservation sector is still largely white dominated in management arrangements as a result of the past apartheid regime, this history they note still impacts and profiles black people's perception of the field as not in their territory thus highlighting the importance of addressing race and social equity directly, in current times, within the sector in order for its transformation promoting inclusivity to be achieved. The representation of all races and particular a larger percentage of non-white races who selected to register for Biological Sciences at university and to take part in my study speaks to moving

towards achieving this transformation of the sector (Figure 5). Their responses also indicated that while some participants identified as 'Black' others identified as 'African', considering that the questionnaires were anonymously submitted, it is difficult to follow up on this aspect.

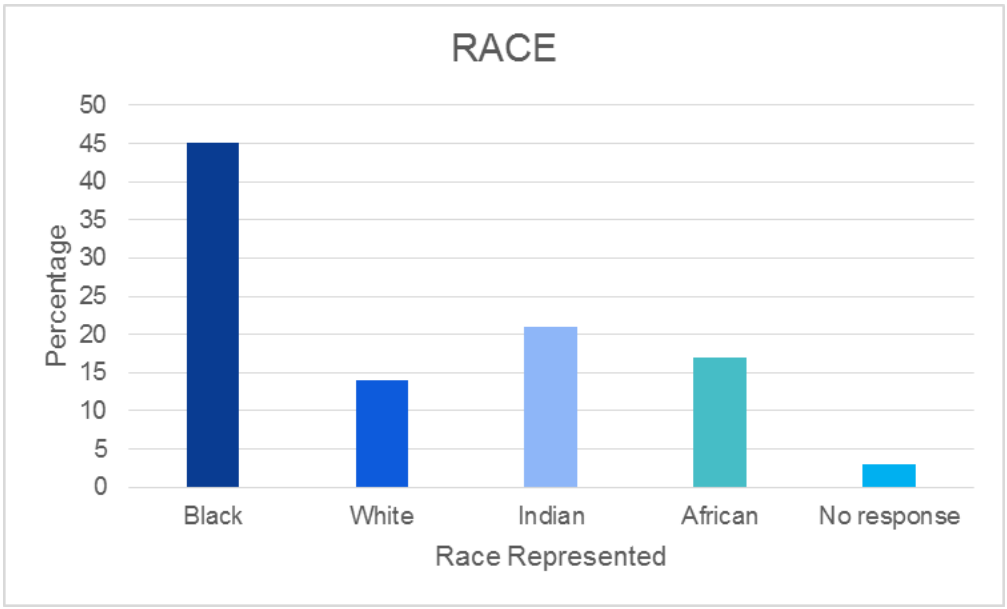

Figure 5: Race representation of respondents

3.1.5.8 Knowledge of Climate Change

Kuo (2010) highlights the importance of a joint support system incorporating the government and civil society in achieving effective international and domestic climate change solutions; thus they stress the importance for the assessment of the youths' understanding and perceptions that may hold power to positively inspire their choices for climate protective actions and support for pro-climate policies. Additionally she illustrates this power of influence that is in the hands of the youth population by denoting how their vote was considered to be the drive behind President Obama's electoral victory (Kuo, 2010). This observation by Luescher, Loader and Mugume (2017) on the #FeesMust-Fall campaign further expresses the potential of youth particularly university students becoming instruments of change. They describe how this movement had evolved from the #RhodesMust Fall, "norm-oriented etudialist movement focused on matters of institutional culture and curriculum", into a nationwide value-oriented campus movement of #FeesMust-Fall that demanded attention from

nationwide campus management and all government spheres (Luescher, *et al*., 2017). This is reminiscence of the change that was evoked by the youth of 1976 as both these examples indicate that when youth are exposed to information and knowledge they can be instrumental in taking “etudialistic ideas” and finding a thread that proves how these may influence or impact society at large. Etudialist student movements are explained by Lescher et al. (2017) as having tendency of being “inward-oriented, primarily towards higher education and student-related concerns” (Luescher, *et al*., 2017). Thus exposure to climate change education may evoke an increased interest, pro-environmental behaviour and increase environmental lobbying.

A similar study that focused on climate change-related perceptions and communication conducted across three communities in South Africa revealed that perceptions varied across communities (Mahl, *et al*., 2020). The authors noted that this variation was linked to variable levels of education; thus reflecting more informed and diverse ideas and understanding of climate change causes, concerns and responses within higher educated communities (Mahl, *et al*., 2020). There were surprisingly no significant variances in what they associated with climate change as they anonymously listed cause and effect that were observable and palpable such as air pollution, water shortages, extreme changes in temperature and weather, environmental degradation as a result of human activities (Mahl, *et al*., 2020). The respondents in my study explained climate change by mostly indicating that its changes were brought about by human impacts or activities such as pollution, and 24% mentioning emissions of methane gasses and ozone depletion with only 3% mentioning the natural induced changes. Only 31% brought about the element of time describing it as a gradual change over years and also indicated that human impacts have increased this gradual rate. This observation is in line with that by Mahl et al. (2020) as both studies show climate change linked to human impacts. While the schooling curriculum caters for topics on climate change in the prescribed syllabus (Table 1 and 2), and respondents acknowledged being introduced to these topics at school, it seems that the depth of information that they have on climate change could require attention since a large percentage of the sample do not seem to see climate change as a natural phenomenon and one that mankind contributes towards as well. In addition most of the respondents did not acknowledge that climate change was a

gradual process which occurs over an extended period of time. This could illustrate that there are some gaps in the students' understanding on this topic.

3.1.5.9 Climate Change Causes

Booth (2012) highlights how often citizens are encouraged to embrace eco-friendly lifestyles by reducing their personal carbon footprint through various activities such as using public transportation, using low-energy light bulbs, and using solar heating. However she further notes how this can only reflect a meaningful reduction in emissions if utilised in conjunction with input by the government by implementing policies and laws that enforce or expedite low-emission infrastructure and practices across all sectors and households as households only account for a very small amount in emissions (Booth, 2012). This is supported by a study conducted whereby households in Australia voluntarily reduced emissions by an average 25 per cent, reducing the national emissions by only 5 per cent (Booth, 2012). When questioned in my study about who they felt were contributors to climate change, participants were split between a generalisation of "human beings" and large industries due to emissions.

The causes of climate change noted by respondents in my study included "human actions, like deforestation, carbon gas excess emissions from unrenewable power stations, increasing human population, the use of unrenewable energy, unsafe food practices (how beef is manufactured for example), water wastage, oil spills, etc.", "fuel and gas companies as well as the meat industry", "global warming", "increased emissions of greenhouse gases" "use of fossil fuels, deforestation". Furthermore they were able to note personal daily activities which they felt had a negative and positive impacts to the environment; such as 76% noted that they believed they contributed directly by "using electricity", "forgetting lights on and taking long showers", not recycling and supporting the use of non-recyclable items for convenience" "…use a fridge that contains cfcs, vehicle transportation releases CO_2". The remaining 24% felt that their activities had very little to not any negative impact at all; they felt that their impact was very minimal and insignificant when compared to that of large industries. Thus this self-realisation of personal impact indicates a presence of some level of awareness of climate change causes.

Understanding the causes of the impact allows for development of properly aligned mitigation and adaptation measures at a personal level. According to Shi et al. (2016) “higher levels of knowledge about the causes of climate change were related to a heightened concern” and so investing in increasing public climate change awareness is imperative (Shi, *et al*., 2016). The data from my study reflected that 76 percent of the respondents considered the burning of fossil fuels and increased greenhouse gas emissions as being the main cause of climate change, while 35% mentioning deforestation thus only the anthropological effects were noted. This linking of climate change to ozone depletion is also evident in studies conducted by Kempton, (1991) and Bostrom, (1994) where participants were inclined to confuse greenhouse effect with ozone depletion including confusing their causes and effects also (Bostrom *et al*, 1994; Kempton, 1991).

Furthermore this confusion was further observed in a study by Lorenzoni and Pidgeon, (2006) as respondents were listing activities such as aerosol sprays as one of the climate change causes. The causes of climate change being linked to human activity by my study respondents also links to their responses to the question “Is climate change a natural or human induced impact?” as again the study population showed high agreement (approximately 86%) in that climate change is human induced with only 14% indicating that it occurs naturally with human activities contributing to its amplified rate. This was also perceived by Ojomo et al. (2015) in their study probing into the knowledge and attitudes of University students and government officials in Nigeria; here too 90% of the respondents believed that human activities are a significant cause of climate change (Ojomo, *et al*., 2015) Additionally 59% of respondents felt that the climate change perpetrators were the human race, with the remaining 41% specifically pointing to industry emissions and predominantly those in developed countries.

Meadows (2020) highlights the need to be aware and knowledgeable about an issue (such as climate change) in order to be able to become engaged with it; and that geography as a subject is viewed as one of the driving tools towards achieving this at school level. He makes reference to the “The International Year of Global Understanding (IYGU)” which aims to increase awareness of daily personal contributions towards climate change and how these can be changed towards more sustainable measures; bearing in mind that in order for this to be achieved there needs

to be a basic understanding on these concepts through awareness and education (Meadows, 2020). The paramount forecaster of individuals intentions and dedication to voting for environmentally sensitive governments is for them to have an understanding of climate change causes; this will in turn aid in changes towards formulation and adoption of sustainable policies (Bord, *et al*., 2000). This is evident from the participant's responses on possible mitigation measures as they listed approaches that may require policy changes thus requiring the backing of the government; such as reducing and monitoring of carbon emission levels, investing in the use of renewable energy sources and the importance of raising climate change awareness through education. It would thus make sense for them to vote for a government that is aligned with such initiatives.

3.1.6 Global and Local Climate Change Impacts

3.1.6.1 Global Climate Change Impacts

Climate change is a global phenomenon with a number of studies conducted globally assessing its impact, such as that conducted by Leemans and Eickhout (2004) focusing on species, ecosystems and landscapes over a range of increasing global mean temperatures and the corresponding temperature and precipitation patterns. Their analysis revealed varying regional difference however even the slightest increase in global mean temperatures will significantly impact numerous species, ecosystems and landscapes (Leemans & Eickhout, 2004). Additionally as little as 1°C and 2°C increases in global mean temperatures most species, ecosystems and landscapes will be impacted and adaptive capacity will become limited (Leemans & Eickhout, 2004). When respondents were asked if they were aware of any global impacts of climate change; their responses as displayed in figure 6 below revealed a great degree of awareness coupled with examples such as

"There has been an increase in average temperatures leading to glaciers and icebergs to melt, more forest fires, more droughts, increased natural phenomena such as tsunamis, floods, cyclones, etc"

"Naturally so…we have constant drought in many places around the world and people not having access to water. Excruciating heat in the places near the equator. Some

people are dying due to climate change. Some habitats are destroyed like icebergs leading to animals losing their home. Plants are dying".

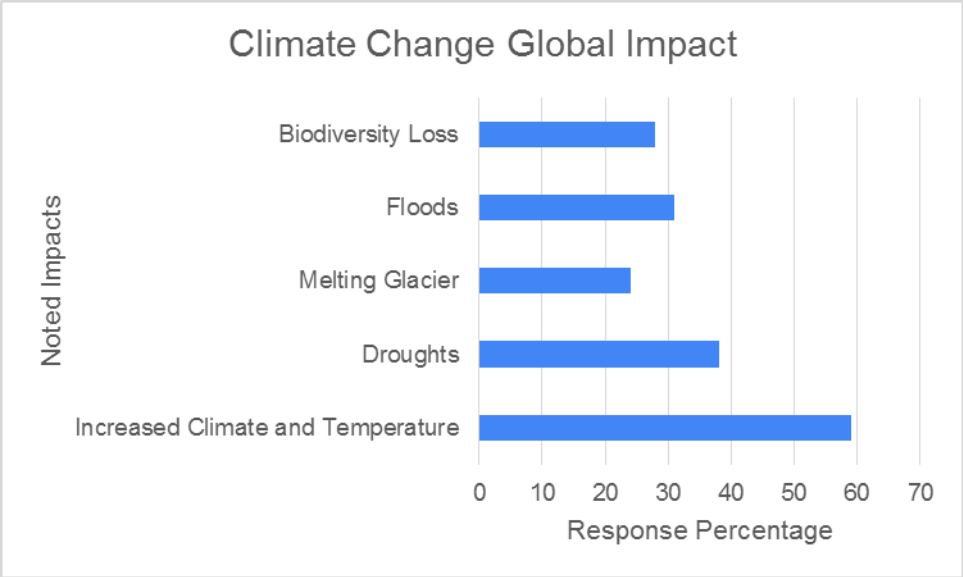

Figure 6: Climate change global impact

3.1.6.2 Local Climate Change Impacts

According to Gupta et al (2007) often global problems like climate change are thought to require a top-down approach by implementing global solutions at different administrative levels worldwide. Their study seeks to challenge this notion by analysing climate change in physical terms to assess its global through to local characteristics and investigates the policy space at different administrative levels to see if it is possible to complement the slow global action with local action (Gupta , *et al*., 2007). Furthermore they argue that climate change is a problem that is both global and local in nature, that policy reactions are probable at various administrative levels (Gupta , *et al*., 2007). Local climate change policy formulation requires local inputs derived from observations and research from a local perspective; increasing climate change awareness in youth could contribute towards increased interest towards pursuing climate change research as future careers with possibilities of contributing toward local change policies.

In my study respondents were asked if they had been impacted by climate change directly or indirectly; some of the response received were

“Global warming: In summer I get very hot, so this is unpleasant and at times it makes me dizzy or gives me a headache. Food: Food is not as healthy as it should be (naturally), so this is not very good for my health. I have been sick quite a few times in my life, so I would think this could have been triggered by our damaged environment”.

This observation speaks directly to the respondent experiencing health challenges due to climate change associated conditions; this is due to human activities that increase global warming contribute towards increasing the rate of climate change.

Another respondent shared that,

“Climate change has made my life very uncomfortable. The changes in the climate has caused erratic weather conditions that affect the way I live and move around. I have become very miserable and uncomfortable owing to dramatic increases in temperatures in my area and my general lifestyle has declined due to it. The droughts and floods that have been caused due to climate change has resulted in food insecurity, causing the prices of food to fluctuate, making life more financially difficult. These are just a few ways in which climate change has affected my life indirectly “.

These responses brings about an indication of climate change impacts and experiences that are varied across geographic contexts. One of the participants noted drought affecting food production at their family farm

“My parents are farmers so changes in rain cycles can cause issues for us such as ruining crops”

This quote highlights the climate change impact on vulnerable communities that are dependent on agricultural activities and the different ways that climate change is experienced by youth across the country in their varied geographical contexts. The fact that the respondents were able to note their experiences, describe them and how they feel towards them means they have gone through the emotional, factual, and consciousness levels in the stages as stipulated in figure 1 by Janssen (1988); highlighting the connection between nature experience and environmental behaviour.

The final stage “action level” will be evaluated when they are asked to suggest mitigation measures.

3.1.6.3 Mitigation Measures

Respondents were all in agreement that there are ways to mitigate climate change and 24% listed reducing and monitoring of carbon emission levels, 17% reducing consumption patterns, 21% mentioned investing in the use of renewable energy sources, reducing pollution levels, and 17% noting the importance of raising climate change awareness as a part of the solution. The study participants listed mitigation measure that were anthropocentric and there were no suggested measure to mitigate natural climate change. Semensa et al (2008) support this notion when highlighting how the ways in which society can be able to respond to climate change threat is through adaptation and mitigation, which is ultimately evoked by awareness and knowledge of climate change these risks associated with it.They describe adaptation as encompassing precautionary measures to avoid, prepare for or react to probable climate change impacts and that it is often a short-term initiative driven by behavioural change; this would include personal level of activism such as these noted by respondents *“changing personal consumption patterns”, “indulging in slow fashion and the less is more mind-set”, “using less electricity” and personal recycling initiatives*, while mitigation is described as finding ways to minimise or reduce sources of emissions through legislation and policy and increasing areas that are natural greenhouse gas sinks (Semenza, *et al*., 2008). The concept of “slow fashion” means “long-lasting, locally manufactured clothing, primarily made from sustainably sourced fair-trade fabrics” (Štefko & Steffek, 2018). Analysis of respondents suggested mitigation measures showed understanding as described by Semenza et al. (2008). Respondents in my study indicated the following measures:

“Regulate companies that pollute, or are large contributors to climate change. Invest in sustainability programs and entities doing research into climate change mitigation and monitoring.”

“If the government can implement new laws that limit the amount of pollution from industries, and laws to fine people who pollute the environment, the climate change can be SLOWED DOWN”.

This understanding of mitigation measure suggests that transfer of knowledge by the schooling curriculum was effective and that this youth will be able to put these learnings to use in their future endeavours. Suggesting mitigation measure that are both at a global, local and personal level indicates that the respondents have indeed reached the final level indicated in figure 1 by Janssen (1988); highlighting the connection between nature experience and environmental behaviour. Here it shows that their “experiences” of nature from a personal local scale to a global possibly experienced through their school curriculum has enabled them to reach the action level in figure 1 and are able to suggest ways to actively engage these impacts.

3.1.6.4 Climate Change Significance vs Social Concerns

South Africa as a developing country is faced with a number of pressing issues to attend to in its aim to provide for its citizens; this incorporates political stability, economic growth, and social development. This dilemma like in most developing countries often leaves the government divided about preserving the environment being their priority as they strive to deliver services to their people and grow the economy. This is also true for their citizens especially those dependant on natural resource for meeting their survival needs. An assessment of South African attitude towards climate change revealed that citizens acknowledged climate change as a pertinent issue but also revealed that many regarded social problems as more imperative and displayed less concern (Mahl, *et al*., 2020). Similarly a study in Nairobi, Kenya investigating climate change perceptions relative to other socioeconomic and environment issues revelled that the prevailing threats were of socioeconomic security, accounting for 76.6% of the variance in the rating and that climate change was perceived to be “like a mere drop in the ocean context pervaded by problems of poverty, unemployment, crime and corruption, etc. which Nairobi faces, as does Kenya as a whole” (Shisanya & Khayesi , 2007). To get an indication of level of concern for climate change, respondents in my study were asked to rate their concern levels across a number of social issues prevalent in the South African context in comparison to concerns for

climate change, the findings follow. As noted earlier that this study utilised the social constructionist theory; this section looks closely at how participants view climate change in comparison with various social concerns hence their "social construction of their environment". This understanding of 'social construction of nature' is important as it brings to light the ability of humans to shape perceptions of nature (Demeritt, 2002).

3.1.6.5 Poverty vs Climate Change Concerns

Majority of the respondents rated poverty as a great concern in their community this raises a question of the immediate desire to meet daily needs versus concern over climate change (Figure 7). It is unlikely that people in poverty will be thinking of ways to save the environment but rather finding means to survive even if it means burning trees to make their home warm and prepare meals. This basically suggests that "for sustainability enhancing innovations in developing countries, poverty presents unique challenges and should be understood as an integral part of the sustainability nexus and the new international business equation" (Khavul & Bruton, 2013).

As illustrated in figure 7 below; the students could select their responses based on a continuum of 1-5, where 1 referred to least concern and 5 meant most concerned, as can be noted there are some concerns over climate change however a larger percentage of respondents seem to not regard it a concern within the youth of their communities. This could be as a result of raised concerns over other social issues that meet their direct and immediate needs such as poverty. This was also observed as an outcome of a study conducted by the Human Sciences Research Council of South Africa (HSRC) (see figure 8 below) looking into South African attitudes towards climate change. They attributed this observation to climate change impacts being perceived as distant threats and thus given a low priority when compared to more immediate threats such as unemployment HIV/AIDS, poverty, service delivery and racism (Seager, 2011).

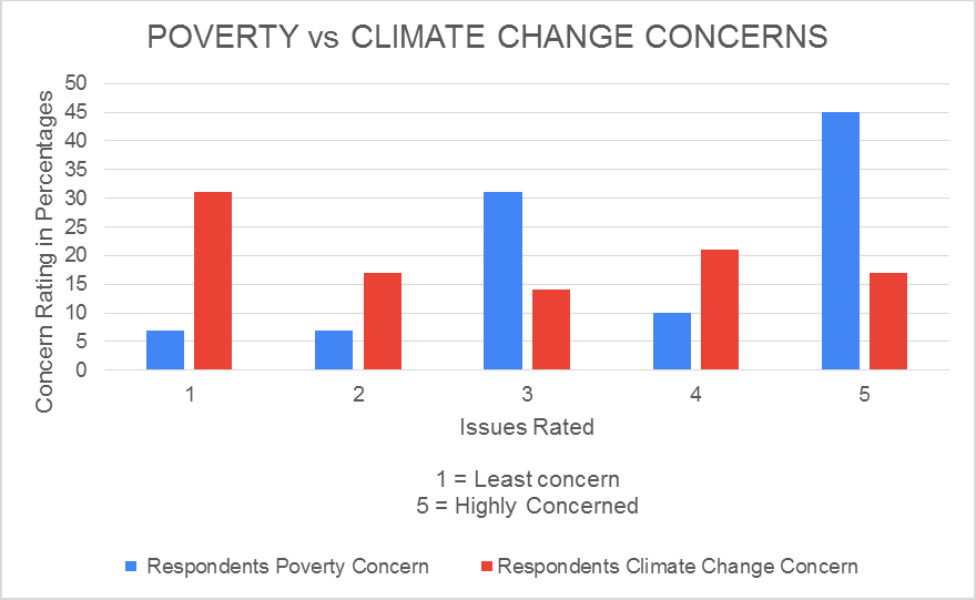

Figure 7: Poverty concern compared to climate change concern

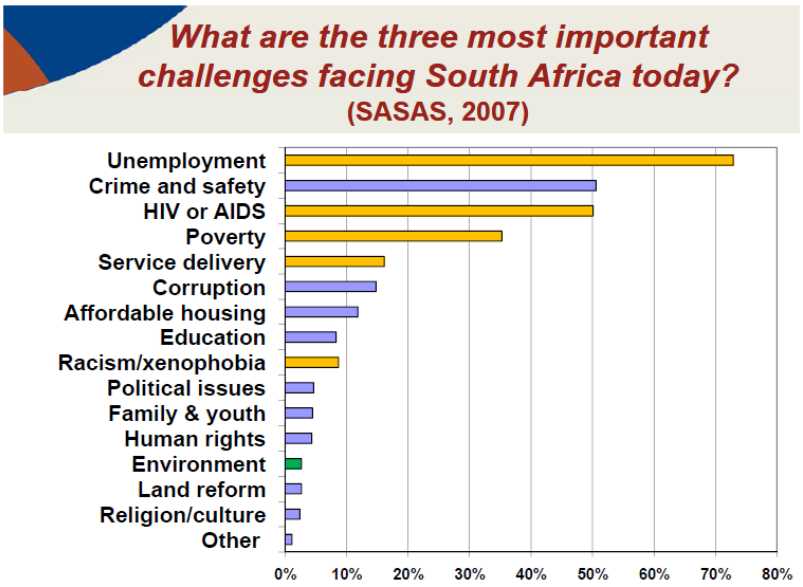

Figure 8. South Africa's challenging Issues

Source: http://repository.hsrc.ac.za/bitstream/handle/20.500.11910/3863/6755.pdf?sequence=1 (Date: 16/08/21)

3.1.6.6 Economic, Crime and Unemployment vs Climate Change Concerns

The economic concern stems from the economic instability and unemployment being the predictor of citizens including the youth's ability to meet needs and have a better future. Also with such an alarming increase of youth seeking entry into institutions of higher learning and employment opportunities and the economy being the driver of these, it is unsurprising that this is of concern to the youth. Crime threatens our safety and that of people's assets thus it poses an immediate threat or concern hence the high ratings shown for this factor (figure 9); where students selected a response to this question based on a continuum where 1 represented least concerned and 5 is most concerned. It is argued that climate change will increase strain, reduce social control, weaken social support, foster beliefs favourable to crime, contribute to traits conducive to crime, increase certain opportunities for crime, and create social conflict (Agnew, 2011). According to Pease and Farrell (2011) crime statistics are directly linked to direct carbon costs; and that it would be impossible to foresee a society that has high crimes rates being a low carbon society. "Conflict has a carbon footprint. Crime is a subtype of conflict. Citizen on citizen predation by force or fraud, and responses to it, have carbon costs" (Pease & Farrell, 2011).Unemployment speak to direct and personal means of securing provisions and meeting needs hence a large percentage of the youth within their communities would consider unemployment as a pressing issue that is of great concern.

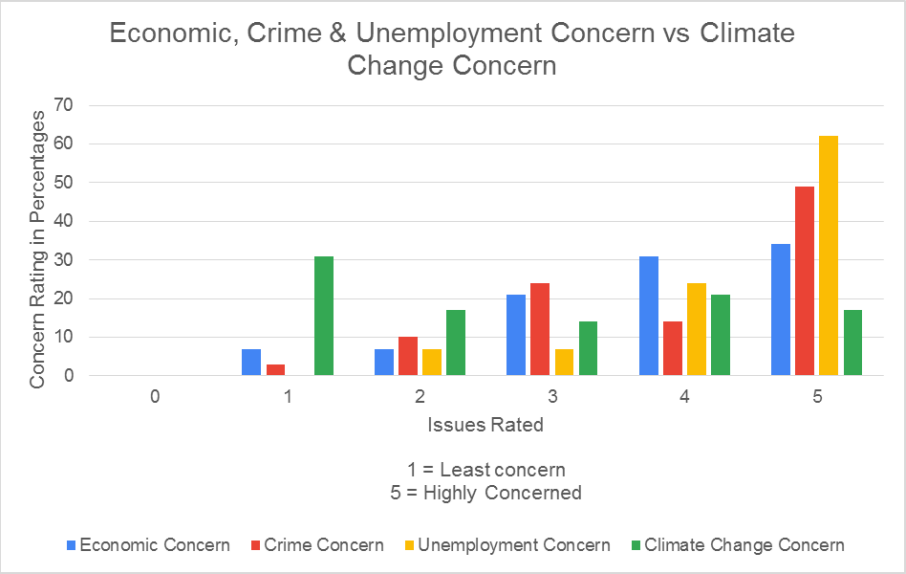

Figure 9: Economic, Crime and Unemployment Concerns compared to climate change concerns

3.1.6.7 Climate Change Health Impacts

Chersich et al. (2019) highlights how climate change affects daily lives of youth directly and indirectly. In their study they discuss how the majority of the South African youth spend their lives navigating between school and home and how this move can increase their exposure to climate change impacts. This observation takes into account that some children still walk for kilometres to get to school with exposure to varying climate conditions through the year. Also there are still a number of schools with buildings structures that are not properly insulated or ventilated. This observation alerts us to the fact that the current research participants in this study also come from varying geographical and economic contexts within South Africa and by virtue of that they would experience climate change impact from varying perspectives including that of socioeconomic backgrounds which would depict the building structure or materials used and ventilation at home and at school. These structures according to this study may not be conducive in protecting them from climate change impacts; they note how extreme heat and cold weather can affect the youth in an informal settlement home setting and attending school in a converted shipping container may be of similar discomfort (Chersich, *et al*., 2019). A substantial percentage of 35% of my study participants rated that they felt climate change affected health and safety (see figure 10 below).

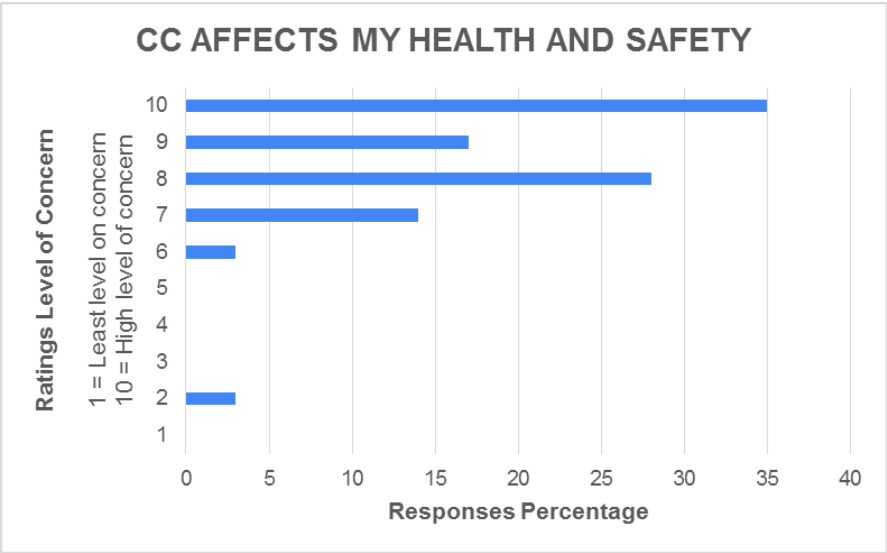

Figure 10: Climate change impact on their health.

3.2. STUDY LIMITS

Covid 19 Restrictions meant that teaching had to be conducted remotely and students thus did not attend lectures on campus; this meant that there was an increase in information through emails and online platforms. For new students who were still trying to familiarise themselves with being at a tertiary institution and the online teaching methods could have introduced an element of information overload. Respondents were invited to be part of the study via email; with increased volume of information being sent to them via email this too could add to their flooded inbox thus there was difficulty in meeting desired number or sample of respondents.

3.3. SUMMARY

This study's research question aimed to discover the youths' awareness and knowledge of climate change and their impact on their environment. Observations revealed that respondents displayed an awareness and knowledge of climate change which they attributed to their schooling curriculum and daily experiences. They were able to define climate change, its causes and possible mitigation measures. There were no differences noted due to differences in their schooling backgrounds and they collectively seemed to relate knowledge to their learnings from geography and life sciences curriculum. There were notable differences from their geographical context when looking at their personal impact due to climate change. Some noted coming from farming background and how droughts has impacted on crop production on their family farm. The ability for my study respondents to explain the concept of climate change, explain its causes, how it impacted them personally and globally and to be able to suggest mitigation measures is in line with Brauns model illustrated in figure 1. This indicated their experience of nature having evoked their emotional, factual, consciousness and action level of environmental awareness.

As mentioned previously, this study was adapted based on one conducted by Bord et al. (1998) where participants were asked about their goals and issues affecting their communities, respondents answered questions about goals and comparative threat knowledge about climate change, social and political values, and of demographics. They noted also how the outcomes proved to be somewhat disturbing as it uncovered

that when global warming questions are incorporated in lists of other environmental and social problems, global warming tends to reflect the least concern and support in relation to the other issues (Bord, *et al*., 1998). Similarly my study respondents were questioned about their goals through questions about their future career choices, they were asked to rate their concern levels towards climate change in comparison with a number of social issues to see if climate change was considered as an immediate concern. Findings revealed a similar trend as social issues such as poverty on figure 7; economic, crime and unemployment on figure 8 revealed concerns higher than that for climate change.

3.4. RECOMMENDATIONS

3.4.1 Social Media and Climate Change Awareness

The use of social media for environmental campaigns has been utilised by a number of activists thus Tlebere, Scholtz and Calitz (2016) suggest that using social media as a tool to increase environmental knowledge and awareness should be explored. They refer to a model called the Social Media for EnviroNmental Awareness (SMENA) model, which has been implemented at a South African university and activities of the environmental awareness campaign were conducted on a social media website (SMENA website) and the popular social media sites Twitter and Facebook. The results showed that environmental knowledge increased as a result of the campaign (Tlebere, *et al*., 2016). As we are moving more towards a technology driven world with youth that is fixated on gadgets; including the use of social media in the schooling curriculum could aid in making the subject material more understandable to learners thus adding value towards the schooling curriculum.

3.4.2 Movies and Climate Change Awareness

Another resource utilised to raise awareness is through movies; a study by Winata and Megasari (2019) looked into how children are being made aware of environmental problems by use of movies such as the Disney movie entitled Moana looking at the dynamics of the inevitable relationship between humans and nature. This movie was found to be symbolic by use of its characters, Maui‘s traits and actions represent human‘s greed to take advantage of nature to the point of damaging the earth. Nature

represented by Te Fiti can be mutually nurturing and destructive, and humans are liable for conserving nature (Winata & Megasari, 2019). Educational movies were proven to deliver an easier understanding of concepts and ideas that would ordinarily seem too complex and overwhelming and the flexibility of being able to rewind and replay means that the concepts are easier to remember (Benze, *et al*., 2019). Additionally they note that the Avatar movie tried to raise awareness of nature/environment education and made extensive emphasis on behaviour towards the environment. Therefore, due to the positive effects of the movie in question, it was concluded that it could make important contributions as an effective teaching material (Benze, *et al*., 2019). This element was not a focus in my study however it is suggested that future studies consider incorporating this component as a valuable teaching and learning strategy.

3.4.3 Theatrical Demonstration and Climate Change Awareness

Another element worth incorporating in future studies in that of utilising drama as a teaching and learning method. In their investigation Sunassee et al, (2012) observed learners and educators attitudes towards science before and after using means of an educational demonstration as a teaching tool. A demonstration called “A Pollutants Tale” focusing on the effect of climate change on the environment and chemistry, proved to be a well-received mode of teaching and learning and was considered as a powerful learning tool that can be incorporated across all levels of the South African schooling science curriculum (Sunassee, *et al*., 2012).

3.5. CONCLUSION

In agreement with prior research, this study found that significant student understanding regarding the causes of climate change. They were able to connect climate change with visible direct pollution, such as exhaust from either a car or factory and indirect emissions such as from electricity use and through product or food consumption. Climate change was observes to be considered less of an immediate threat when compared to other social impacts and thus received low concern percentage rating. Respondents were observed to have experience nature at varying degrees and were thus able to describe, explain and understand environmental concepts; allowing them to develop environmental attitudes leading to possible behavioural outputs.

3.6. APPENDICES

Appendix 1: Research Study Application

FORM B - REQUEST TO CONDUCT RESEARCH AT THE UNIVERSITY - QUESTIONNNAIRE

This form must be completed if you wish to conduct research by using a questionnaire. The questionnaire will be e-mailed by the University to Wits staff/students. Please email form to Ashleigh.davids1@wits.ac.za

First Name	**Surname:**
Lungile Nontuthuzelo	**Nongqayi**

Staff/Student number:

2365788

Degree currently registered for:	**University (If not a student at Wits):**
Masters in Environmental Science	**Wits University**

Research title: 'Exploring the Youths' Awareness and Knowledge of Climate Change: Analysis of first-year students' perceptions of climate change within a South African University'.

Has ethics clearance been obtained from Wits/ your University Ethics Committee?

✓ **YES**	**NO**

(If yes please include a copy of the ethics clearance and protocol number below)

Protocol number:

HA2003

Please note that if ethics clearance has not been obtained you will not be able to conduct your research until the required permission has been granted.

Please provide the link for your questionnaire and/or attach a copy (the link will be emailed to students in order for them to complete the questionnaire):

Please see Questionnaire link below:
https://docs.google.com/forms/d/e/1FAIpQLSfn_akPwnNnc5QCPJEKPd2J8JO_N7zTVYP0v9fO15bDfvePPg/viewform?usp=sf_link

Please provide us with a brief message that will accompany your questionnaire. This message will be e-mailed to students requesting them to complete the questionnaire:

Dear Student,

I would like to invite you to participate in an online survey aimed at looking into the youth's awareness and knowledge of climate change which will take about 25-30 minutes. It will basically look at individual perceptions of this phenomenon and how youth views its impacts.
There is an information letter at the beginning of the survey and you will need to give consent to participate.

Please indicated to whom this questionnaire needs to be sent? (Please tick the appropriate box)

Students	✓
Others (please specify)	

If the research will be conducted on students please specify the year of study and if they need to be registered for a specific degree or within a particular Faculty:

First Year Students	**Students from the Introductory Life Sciences (ILS) Year 2021**
Second Year Students	
Third Year Students	
Fourth Year/Professional Degree Students	
Final Year Students	
Postgraduate Students	
Faculty	**Faculty of Science**
Degree	

Student signature: ……  **Date…19 October 2020**

Appendix 2: Ethics Approval of Study

UNIVERSITY OF THE WITWATERSRAND, JOHANNESBURG

OFFICE OF THE DEPUTY REGISTRAR

04 November 2020

Lungile Nongqayi
Student number (2365788)
Masters in Environmental Sciences
School of APES

TO WHOM IT MAY CONCERN

"'Exploring the Youths' Awareness and Knowledge of Climate Change: Analysis of first-year students' perceptions of climate change within a South African University"

This letter serves to confirm that the above project has received permission to be conducted on University premises, and/or involving staff and/or students of the University as research participants. In undertaking this research, you agree to abide by all University regulations for conducting research on campus and to respect participants' rights to withdraw from participation at any time.

If you are conducting research on certain student cohorts, year groups or courses within specific Schools and within the teaching term, permission must be sought from Heads of School or individual academics.

Ethical clearance has been obtained. (Protocol number: **HA2003**)

Research commencement: (15 March 2021)

Nicoleen Potgieter
University Deputy Registrar

Appendix 3: Research Participants Information Sheet

Research Participant Information Sheet

Good day

My name is Lungile Nongqayi and I am a Masters student in Environmental Science at the University of the Witwatersrand, Johannesburg. As part of my studies, I have to undertake a research project, and I am investigating youths' perceptions, awareness and knowledge of climate change under the supervision of Dr Shalini Dukhan and Dr Ida Risenga. The aim of this research project is to investigate the level of awareness and knowledge our future leaders, "the youth" of South Africa have on climate change. The focus of the survey is on measuring youths' awareness and knowledge of climate change, perceptions to climate change will also be examined on the survey. As part of this project, I would like to invite you to take part in answering an online questionnaire. You will be provided with the consent form on the first page of the online survey. Submission of the completed survey will also be taken as consent to participate in this study and responses will be treated confidentially, and identities (names and the name of the organisation) will be anonymous. This activity will involve filling in a consent form to indicate your interest in taking part in this study and thereafter answering questions and sharing personal perceptions pertaining to the environment and climate change and will take around 25-30 minutes.

There will be no personal costs to you if you participate in this project, you will not receive any direct benefits from participation but there are no disadvantages or penalties if you do not choose to participate or if you withdraw from the study. You may withdraw at any time or not answer any question if you do not want to. The questionnaire will be completely confidential and anonymous as I will not be asking for your name or any identifying information, and the information you give to me will be held securely in a password protected personal device and not disclosed to anyone else. If you experience any distress or discomfort at any point in this process, you may stop the questionnaire or resume another time.

If you have any questions during or afterwards about this research, feel free to contact me on the details listed below. This study will be written up as a research report if you wish to receive a summary of this report, I will be happy to send it to you. The data collected from this research project will be stored in a password protected device and will be kept for the project duration and possibly for the researchers future study continuation.

If you have any concerns or complaints regarding the ethical procedures of this study, you are welcome to contact the University Human Research Ethics Committee (Non-Medical), telephone +27(0) 11 717 1408, email hrec-medical.researchoffice@wits.ac.za

Yours sincerely,
Lungile Nontuthuzelo Nongqayi

Researcher:
Lungile Nontuthuzelo Nongqayi
Wits email: 2365788@students.wits.ac.za
Supervisors:
Shalini Dukhan, Shalini.Dukhan@wits.ac.za
Ida Risenga, ida. Ida.Risenga@wits.ac.za

Appendix 4: Study Consent Form

Research Participants Consent Form

(Please note: since the survey will be provided online this consent form will follow the information letter as the first page of the online survey. Students will be able to select the response they wish to, and then they will be told that submission of the completed survey will indicate the consent to participate in the study).*

Title of project: 'Exploring the Youths' Awareness and Knowledge of Climate Change: Analysis of first-year students' perceptions of climate change within a South African University'.

Name of researcher: Lungile Nontuthuzelo Nongqayi

I, ……., agree to participate in this research project. The research has been explained to me on the information sheet and I understand what my participation will involve. I agree to the following:

(Please circle the relevant options below).

I agree that my participation will remain anonymous	YES	NO
I agree that the researcher may use anonymous quotes in his / her research report	YES	NO
I agree that the information I provide may be used anonymously after this project has ended, for academic purposes by other researchers, subject to their own ethics clearance being obtained.	YES	NO

Appendix 5: Study Questionnaire

'Exploring the Youths' Awareness and Knowledge of Climate Change: Analysis of first-year students' perceptions of climate change within a South African University'.

Section 1: Demographic Information

1. Gender
   Female ☐ Male ☐

2. How old are you?

   18-25 years ☐ 26-45 years ☐ more than 45 years ☐

3. Race? _____

4. In which area or suburb do you reside? _____

5. Did you attend a public or private high school? _____

6. Which high school did you attend, and in which area is the high school?
_____

7. Did you take Geography as a subject in Grades 10-12 of high school?

   Yes ☐ No ☐

8. Did you take Life Sciences as a subject in Grades 10-12 of high school?

   Yes ☐ No ☐

9. What career or field would you like to work in once you complete your studies?

_____
_____
_____

10. Did your school curriculum inspire your career interest? If so, please elaborate.

_____
_____
_____
_____

Section 2: Awareness and Knowledge of Climate Change

1. Are you aware of the term Climate Change? If so, how did you come to an awareness of climate change?

_____
_____
_____
_____

2. In your opinion what is climate change?

_____
_____
_____
_____

3. Did you cover climate change in the curriculum offered at your high school? If so, what topics did you cover under climate change and environment at high school?

_____
_____
_____
_____

4. What are the causes of climate change?

_____
_____
_____
_____

5. To what extent do your everyday activities impact on the environment?

_____
_____
_____
_____

6. How has climate change affected the world (i.e. the global context)?

_____
_____
_____
_____
_____

7. Is climate change a natural or human induced phenomenon?

_____

8. Who do you feel are the perpetrators of climate change?

_____
_____
_____
_____

9. Do you feel you have contributed to climate change?

_____
_____
_____
_____

10. Are there ways to mitigate climate change?

_____
_____
_____
_____
_____

11. Who is responsible for mitigating the triggers associated with climate change?

_____
_____
_____
_____
_____

Section 3: Personal Ratings of Impacts

1. On a scale of 1 to 10 please rate, how much do you think climate change threatens your personal health and safety?

1	2	3	4	5	6	7	8	9	10

2. On a scale of 1 to 5, please rate, which issues are of more concern within the youth of your community.

	1	2	3	4	5
Teenage pregnancy					
Poverty					
Climate change/global warming					
Overpopulation					
Unemployment					
Gender based violence					
HIV and AIDS					
Crime					
Economic situation					

1. How has climate change affected you directly or indirectly? (Water source, food source, floods, droughts, extreme temperatures…etc.)

3.7. References:

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