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Namibian pre-service science teachers' perspectives on environmental issues

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Abstract: As with many countries worldwide, Namibia is, despite its relatively small population and stable government, facing some significant environmental problems. This research sought to determine how a group of potentially influential tertiary-level students perceived the state of the environment in Namibia. To this end, a cohort of 20 preservice science teachers were interviewed to determine their perceptions of the environmental issues facing Namibia. The majority of the cohort identified deforestation as the major such issue. They also associated this concern with other problems such as soil erosion, salinity, and desertification. Some also raised concerns about global warming and associated climate change; several of the preservice teachers believed the country was already experiencing the effects of this. Although the population of Namibia is quite small relative to its area, the future teachers perceived population growth as a problem contributing to both environmental and social problems. All viewed education as key to reducing family size and alleviating social and environmental problems. However, none of the cohort made any connection between increasing patterns of consumption and environmental degradation.

Keywords: Namibia, preservice teachers, environmental issues, deforestation, climate change, population.

1. Introduction and background

Environmental education (EE) in schools is seen as an important strategy for environmental sustainability. However, if teachers are to engage their students effectively in EE, it is a reasonable assumption that they should have an understanding and a secure knowledge of key contemporary environmental issues and a positive attitude towards the environment. The important role of accurate scientific knowledge in teaching and learning about the environment has been argued in some detail by a number of authors (see e.g. Boyes et al., 1995; Cutter-Mackenzie and Smith, 2003; Skamp, 1999). Despite this, studies in a number of countries

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indicate that, in some instances, environmental knowledge amongst teachers is limited. For example, Robertson and Krugly-Smolska (1997) investigated a small group of Canadian teachers who considered themselves environmental educators. The authors concluded that the teachers had difficulty implementing environmental education at the following levels:

- *conceptual*, due to a lack of clarity about what environmental education is,
- *teacher responsibility*, where they were not certain if they were permitted to do things consistent with a socially critical agenda of environmental education, and
- *practical*, in terms of, for example, organising time or materials.

Environmental attitudes also form part of the present study, as education, even at primary level, can play a significant role in the formation of environmental attitudes (Strong, 1998). Because teachers are instrumental factors in the formation of these attitudes (Said et al., 2003), their views about environmental issues are significant. For example, teachers are often in a position to explain to children the issues surrounding 'needs versus wants' and perhaps counter the very pervasive materialistic messages youngsters receive through diverse media. According to Shah (2006), marketers see children not only as a current but also a future market and hence work to facilitate brand loyalty at a young age in the hope of securing continued later sales. Increased patterns of consumption will inevitably lead to more waste, pollution, and increased emissions of greenhouse gases whether through manufacturing or the transportation of goods.

The qualitative study presented in this paper examines the views, concerns, and understanding of a number of preservice secondary science teachers in relation to environmental issues in Namibia. The specific research questions that informed the study were:

- To what extent are preservice science teachers in Namibia aware of environmental issues and problems in the country?
- What specific concerns do these students exhibit about the environment in Namibia?

While the literature on teachers' attitudes towards the environment is extremely limited, a number of studies have been conducted with large groups of young people. From their survey of 2,238 students in 58 schools in the state of New South Wales, Australia, Walker et al. (2002) found, perhaps surprisingly, that geographical location, ethnic background, and socioeconomic status had little impact on the environmental knowledge, attitudes, values, and skills of these young people. However, gender did make a difference, with girls being generally more concerned about environmental issues than boys. Fien (2000), reporting the findings of a major survey of

young people across 10 countries of the Asian Pacific and Pacific Rim regions, found that although these individuals were very interested in learning about environmental matters and in improving the environment in their countries, they tended to be ambivalent about making the lifestyle changes and practising the civic responsibility needed to realise this goal.

Several studies, including those by Fien (2000) and Walker et al. (2002), as well as one by Fleer (2002), show that young people, although concerned about the environment, have neither the necessary skills to drive change nor the fundamental belief that they can have an impact on the future. This is where teachers can step in. But although teachers can influence the environmental attitudes of their students (Said et al., 2003), the literature indicates that if that influence is to be a positive one, teachers require appropriate content and pedagogical knowledge (Summers et al., 2000) coupled with favourable attitudes towards environmental protection and sustainability.

2. Context of the study

Namibia, previously known as South West Africa, gained independence from South Africa in 1990. Its large land-mass covers an area of approximately 825,418 square kilometres. Much of Namibia is desert, with only 0.99% arable land. The country has erratic and sparse rainfall. McGann (2004: 1) states that Namibia's "vegetation type is mainly woodlands, savannah and low growth forest with a landscape consisting of desert and bedrock. Water resources are limited to mainly ephemeral rivers and … wetlands and other water bodies tend to be temporary." Accordingly, environmental education is of great importance to Namibia's development and existence, and several documents, including *Vision 2030* (Office of the President, 2004), which envisions Namibia as a developed nation by 2030, pay particular attention to the importance of environmental sustainability and EE.

Namibia shares borders with Angola and Zambia in the north and northeast, respectively, Botswana and Zimbabwe in the east, and South Africa in the south. Its western border is the Atlantic Ocean. Namibia's population is estimated to be just over two million people (Central Intelligence Agency, 2013), with the majority living in the far north close to the Angolan border, where the wetter climate allows for significant livestock and crop production, not possible in

much of the rest of the country, which has a desert climate. In 2013, estimates gave the fertility rate as 2.33 children born per woman (CIA, 2013), so the population growth rate is high, albeit from a low base.

Namibia also has a rapidly growing middle class and associated consumer culture. The capital city, Windhoek, has a number of large shopping malls where 'designer' shops and products have a high profile. Television, both local and satellite, has a high advertisement content aimed largely at the growing middle class. These advertisements generally equate consumption with success, and portray it as something to aspire to.

3. Government policy on the environment

The Namibian constitution recognizes the vulnerability and sensitivity of the Namibian environment to unplanned exploitation. The constitution accordingly commits the country to the maintenance of its ecosystems, essential ecological processes, and biological diversity, and to utilizing living natural resources on a sustainable basis for the benefit of all Namibians, both present and future. In particular, "the Government shall provide measures against the dumping or recycling of foreign nuclear and toxic waste on Namibian territory" (Republic of Namibia, 2002: Art. 95I). Proclamations such as this reflect the importance that Namibia attaches to protection of its environment and hence to providing EE in schools.

The Ministry of Education's (Republic of Namibia, n. d.) emphasis on EE aligns with the recommendation of the world's first Intergovernmental Conference on Environmental Education held in Tbilisi (in the then USSR) in 1977. This recommendation called for EE to be an integral part of any realistic problem-solving and lifelong education initiatives relative to environmental protection and conservation. The final report of the Tbilisi conference (UNESCO-UNEP, 1978: 26) set down three goals for EE:

1. To provide clear awareness of social, political, and ecological interdependence.
2. To provide every person with opportunities to acquire the knowledge, values, attitudes, commitment, and skills needed to protect and improve the environment.
3. To create new patterns of behaviour of individuals, groups, and society as a whole towards the environment.

Namibia subscribes to all three goals. However, environmental degradation due to desertification remains rampant in most parts of Namibia. This is because local communities need fuel and materials for building houses and shelters. Mining, factories, unplanned settlements, and other human activities that lead to release of air and water pollutants also add to environmental degradation in Namibia. Given these conditions, it is not surprising that schools, and the young people within them, are seen as highly important means of reducing despoliation of Namibia's environment and of practising environmental sustainability, thereby ensuring that the environment is preserved for future generations. EE thus needs to hold a prominent place in the Namibian curriculum.

Given these aspirations, good teachers of EE are very important to Namibia's future. Consequently, in the present study, a number of students in Namibia training to be teachers of secondary school science were interviewed in order to gain some insight into their understanding of environmental issues and their general attitudes towards Namibia's environment.

4. Methodology

The methodological approach selected for this research inquiry was a qualitative one within an interpretivist paradigm (Guba and Lincoln, 1989, 1994). The authors deemed qualitative approach to be the most appropriate one because of their desire to gain an indepth understanding of the preservice teachers' perceptions of key environmental issues in Namibia.

As Patton (1990: 165) points out, "the advantage of the quantitative approach is that it is possible to measure the reactions of many subjects to a limited set of questions, thus facilitating comparison and statistical aggregation of data." In contrast to quantitative inquires, a qualitative approach typically produces a wealth of detailed data about a much smaller number of people and cases. Hence, depending on the issue of interest, researchers may find it more useful to carry out an indepth investigation using fewer subjects in order to gain greater detail about specific issues. Furthermore, according to Coll and Chapman (2000), studies involving students' perceptions, as is the case with this current study, utilize interviews as a key data-gathering tool, allowing the researcher to probe participants' views in depth.

An opportunity sample of 19 preservice science teachers in their final year of study on a B.Ed. degree at a major university in Namibia was used in this study. Of the 19 participants, only four were males, but this proportion reflected the make-up of the overall final year cohort on the degree. The majority of the participants came from the north of Namibia near the Angolan border, which aligns with the fact that the largest proportion of Namibia's population lives in this fertile region. Patton (1990) maintains that a convenience sample such as the one used in this inquiry is appropriate provided the sample represents a target group relevant to the inquiry. This was indeed the case here.

5. Data collection and analysis

Semi-structured interviews, conducted individually with each preservice teacher and typically taking about 20 minutes to complete, were used to collect data. During the interviews, the preservice teachers were first asked what they considered was the most important environmental issue facing Namibia. They were then asked a series of follow-up questions related to their response, including whether they believed the government was acting to counter this perceived environmental problem.

All interviews were audiotaped and fully transcribed. A number of themes emerged from scrutiny of the interview data. Some of these related directly to specific interview questions while others emerged during discourse. These themes have been used to structure the report of the research findings presented below. Excerpts of the interview data have been extracted from the appropriate categories and used to support the data analysis and summary of findings. All excerpts quoted are verbatim transcriptions from the taped interviews, although transcriptions have undergone slight editing to improve readability (e.g., removal of repeated words, removal of filler words, and changes of tense). Particular care was taken to avoid changing the meaning of any of the participants' views, and pseudonyms are used throughout.

6. Research findings

As mentioned above, the findings are presented under the series of themes or categories that emerged from the interview data. Assertions made about the findings are supported by extracts from the interviews.

6.1. Main environmental problems in Namibia

6.1.1. Deforestation

All of the participants were asked what they saw as the major environmental problem facing Namibia. Nearly all said that deforestation was the most significant such issue. As noted earlier, most participants came from the north of Namibia close to the Angolan boarder where population density is significantly higher than elsewhere and where there is consequently more pressure on resources, particularly the forested areas, which are being exploited for firewood and building materials.

> *Hilma:* The main problem that is facing Namibia about the environment is that, like, from the north, most of the people they cut down the trees … that cause deforestation, and at the other side is that when those people cut the trees, it takes time for the tree to recover … and another thing is that the rainfall that we receive, sometimes it's not that much.
>
> *Interviewer:* So why do people cut down the trees?
> *Hilma:* Some of the people they used to cut trees to, like, to build their house; some use it for firewood.
>
> *Martha:* Yeah. Like, let me say even the northern part of Namibia, people cut down trees to make houses since they are, some of them, they are very poor. They cannot afford, like, building materials to make their houses. They cut down trees to make houses and use, like, firewood since there are no electricities.

Many of the preservice teachers could see the links between deforestation and other environmental problems, such as soil erosion, salinity, and flooding. Amelia demonstrated a clear

understanding of the environmental impact of tree clearing, suggesting this was largely due to a lack of education amongst those involved.

> *Amelia:* Now, because of the water, which washes away everything, and due to many people who are cutting up trees, so everything is now changed completely. And now, this year, if you go and walk around, you see the white ground, and when you taste it, it's salt, which means now everything which used to grow there and the animals which used to be there, everything is now totally completely out. The *mahangu* [pearl millet] is no more growing …They don't know, seriously, because if they understand that when you cut one tree, at least plant three more to save even the soil, because now even the topsoil is always washed away, and when the wind starts, you know, we have strong winds, sometimes they blow the topsoil away.

Other participants also raised the connection between environmental damage and the need for education.

> *Fillimon:* In the north … people are damaging the environment in the way that they don't understand. They cut the plants down, and then they get their wood, and then they build their houses like that. Apparently, when I read, they are saying the more you cut down the trees, you are even affecting the rain season.

6.1.2. Desertification

The other major problem identified by nearly all of the future teachers was the on-going desertification in a country that is already classified as 55% desert or arid, with a further 37% of the land area classified as semi-arid (Commonwealth.ednet, 2013). All commented on the link between this problem and deforestation as well as with people endeavouring to cultivate land unsuitable for this purpose.

> *Justin:* People also will end up cultivating land that is not suitable for producing crops. In that case, they will destroy the habitat of the species and all that.

Some of the students blamed the problem of desertification on the government's policy of allocating land but then failing to provide people with sufficient training in how to maintain its fertility.

> *Josef:* The government is relocating people into farming, but these local people get on the land and they absolutely degrade the land. Like, if you look at most parts of the country, it is on its way to desertification; they are clearing, so we have a problem of loss of species going on or I should say loss of habitat. The people are not given enough information on how to maintain the land that they are getting, so there is over-exploitation of the resources that the local people are getting, and what we get at the end of the day [is that] we remain with land that cannot support our needs.

6.2. Other identified problems

6.2.1. Litter and plastic waste

Some students viewed litter as a significant problem, possibly because in the capital city (Windhoek), and specifically on the campus of the university attended by the participating students, it is a highly visible phenomenon. Increasing consumption and packaging and, in particular, the excessive distribution of plastic bags, is likely to exacerbate this problem, as the following student suggested:

> *Lahya:* I think it's worse in Windhoek because here people they go for shopping and they buy things in plastic bags and bottles. If they use those things, they dump [them] everywhere, like around the environment.

Again, the students who identified this behaviour linked it to poor understanding.

> *Joanna:* I think its ignorance, and for some they don't see the importance of … the dustbins are all over, but they don't see the importance of putting it in the dustbin. So, yeah, but it's basically to do with ignorance.

One student indicated that her own education had shaped her values in relation to litter.

> *Paula:* I guess it's something I grew up with. Like my teachers always told me you should not throw papers, and the fact that I'm becoming a teacher, I should be a better leader.

General discussion relating to the questions asked during the interview made it clear that all 19 participants were aware of the specific problems of plastic waste and the concept of degradability.

> *Joanna:* Yeah, plastic is a different thing. Plastic is a non-biological thing, but papers they are biological or something they can break down. Plastic, they can stay there for many years if they are not, like, collected for recycling. They will just stay there.

6.2.3. Global warming

All of the student teachers were also aware of global warming and its causes, although a few linked the cause to the hole in the ozone layer, a common misconception (see e.g. Boyes et al., 1995). Most of the participating students said they had visited the concepts of global warming and climate change during their secondary schooling and also through a compulsory unit in environmental biology that formed part of the B.Ed. in Secondary Science.

There was a strong sense amongst participants that the effects of global warming were already being seen in Namibia.

> *Joanna:* We can already see some of these symptoms or signs of the climate change because, like, now, every year we have flood, which never happened in the past years, and sometimes the rain can come early or too late.

> *Fillimon:* Yeah, like, now, it is getting hot, yeah, and then the other is the rain, the raining season. We only have few times of the rain … few times during the year; like, a few months where we expect the rain. So, about half of the year we don't get the rain, and therefore most of the plants just die because of lack of water. Yeah … it's like the climate is changing; like, there is a time of the year that you will get a lot of rain that you never expected. I don't know how that happens. And then there is a time where we will get a little amount of water.

> *Vinia:* Yeah, I think because when I was growing up maybe I don't used to notice, but the temperatures, the climate, was a bit good and favourable, but now it's getting harsh.

> *Augustinus:* I remember even my grandma used to say, "We used to receive a lot of rainfall. What is happening?" So people have already seen something is changing, but they do not know how it came about.

When the preservice teachers were asked if their fellow students outside of science ever registered any concern about climate change, they said this was extremely rare.

> *Augustinus:* I hear that a lot from my lecturers. I do not hear that much from my friends because you know … when you are young, the focus is just … Most of the young people, their focus is on the fashion and the media. Those are the things that they are focusing on, but as for me I know there are a lot of things that are changing, and because my concern is the life of tomorrow, there are a lot of things that keep changing, and I don't know what will happen in a few years to come.

6.2.4. Population growth

The preservice teachers were also asked their view about Namibia's rate of population growth. Because Namibia is a huge country with a land area of 825,418 square kilometres and a population of just over two million people, there is a sense that it is under-populated. However, as mentioned above, much of the country is extremely arid, and although starting from a low base, population growth is quite rapid at an estimated two per cent per annum. However, drawing on World Bank data, the Trading Economics website (2013) shows that the rate has slowed from a high of almost four per cent in the mid-1980s.

Many of the preservice teachers interviewed came from families of six or more children and consequently were aware of Namibia's population growth. Some of those interviewed linked population growth with potential degradation of the natural environment and with deforestation in particular.

> *Joanna:* It's really bad because if they have a lot of children, this would lead them to cut down trees and then to create houses or homes for those kids; that's the problem, and then air pollution. Now, what if you think is a small village with sixteen houses, every house is going to produce air pollution or something like that, instead of a small village with five houses, [but] it's still contributing a lot.

> *Vinia:* It's not good because there are more people in the place—more trees are being cut down—so that's bad for the environment.

> *Katrina:* It's very bad because, let me say, like, for example, I say if they are not [having fewer children], they cut down trees to make houses. The more kids we have, the more trees will be cut down to make more houses for us to live [in]. That's the bad effect of the more population.

Other participating students saw a strong connection between population growth and social problems.

> *Selma:* People are very poor. Like, you can find their house where there is a mother and father and kids and no one is working and kids are really suffering. They don't have, like, clothes and no one to pay for their school fees. It's really dangerous in Namibia to have a very big family… and then, like, when you come in this town, people are, like, living in shacks.

However, there was a sense that economic factors combined with improved education opportunities, particularly for women, were resulting in a reduction in family size and consequently the population growth rate.

> *Augustinus:* It's changing the people who have been living in town because they have faced the challenge of electricity bills and water bills, including the house [costs]. You know, they always pay monthly. In addition to the [costs of] school, [there is the concern of] how to take their kids to get the quality education. They have come to realize it's a very big problem if you're a very big family because you'll not be able to support [your family], but then in villages or rural areas it's [large families] still happening.

> *Amelia:* Yeah, families are often big. Some you might find them having even ten or eleven children, but nowadays they are reducing due to the resources they cannot afford anymore because normally we used to survive on our *mahangu* as I told you, and now we don't get *mahangu* enough for the families, so they also stopped producing that much.

> *Josef:* Yeah, I put it down to education most of the time. I put it down to education. I mean, the more educated the person is, the more realities you see as a person, and then the more decision-making power a woman in a couple has compared to men. Like, in the past, men were more powerful, so women were just the housewives, but now women also have decision-making powers.

Josef's claim certainly appeared to be true of the educated female students who participated in this research. Although, as mentioned previously, most of them came from large

families, nearly all of them stated that they wanted to complete their studies before starting a family and that they intended to limit the number of children they had to two or three.

6.4. The link between consumption and environmental sustainability

When the future teachers were asked about this link, none of them was able to respond, perhaps because, as is the case in most societies worldwide, buying more and more things is actively encouraged through the media. Furthermore, in Namibia, the growing middle class with the commensurate increase in disposable income is likely to increase levels of consumption in years to come.

6.5. The role of government

Finally, the preservice teachers were asked if they thought the government of Namibia was doing enough to protect the environment. Views on this were mixed, with some participants viewing the government's actions as inadequate while others felt they were doing as much as was possible. The following preservice student, for example, clearly felt the government was lacking in its efforts.

> *Fillimon*: No, the government is not really talking about anything on the environment. They are not talking about anything; they are not doing anything about the environment because they are the ones who are having big farms, those people … the government officers are the ones that are having big farms, and it's like they are encouraging their people to get big farms also, so they are not doing anything about the environment.

Other students, however, clearly felt very differently.

> *Heleni:* Yes, there are programs that are going around from there. I have attended the climate change conference, which was at last month or the other month, and you could see what people have come up [for it]. They [the government] do give funds for people that want to do research in such an area, anything that has to do with the environment, climate change and especially with … What is it? This, not awareness, but how do you call it? Sustainable! And they give funds. People are doing something

> for crops and things like that. A lot of things are going on, and, yeah, the ministry does a bit.

Several students expressed ambivalence about the governments' role in protecting the environment. This comment was typical.

> *Augustinus:* The government tries their best. I hear a lot from the Minister of Forests talking about securing or taking care of organisms that we have in order when the tourist comes. At least they [the tourists] see what's happening and what does Namibia have in terms of species. But then, on the other hand, is when investors come; they go through the government. So, if they want to build a mine … they go through the government. So if the government allows a lot of people to do mining, to have a chemical power station, we can also say it contributes to this environmental pollution.

7. Conclusions

There were some encouraging outcomes from this research. First, there was a high level of awareness among the preservice science teachers of key environmental issues facing Namibia. Second, the majority of the participants appeared to be concerned about the environment and considered that its protection is an important one that Namibia has to address. Third, knowledge about a range of environmental issues was relatively good, although there was considerable confusion about the greenhouse effect and the hole in the ozone layer in relation to climate change and global warming. This third outcome is perhaps not surprising, however, given similar findings in studies carried out in western countries (e.g., Boyes et al., 1995; Summers et al., 2000, 2001).

Overall, the group of preservice science teachers who participated in this study appeared to have adopted what Fien (2000) refers to as an 'environmental paradigm', insofar as they expressed concern about the environment. However, a worrying finding is that the participants made no link between consumption patterns and environmental damage through the exploitation of resources or the generation of waste. If this lack is verifiable, it could represent an important gap in future teachers' environmental knowledge that needs to be addressed (Payne, 1995). This concern is also a particularly cogent one because as people destined to shape the views and

attitudes of future generations of children, preservice teachers could help Namibia bring in controls (presently all but non-existent) over targeting children, as now and future consumers, through advertising, particularly on television. As Shah (2006) points out, the need for businesses to make sales and secure profits is understandable, the effects of increasingly targeting children to be consumers and overly conscious of materialistic things need to be questioned.

Perhaps the most encouraging finding of this research was reference to the impact of education on females and consequently population growth. Many of the female students interviewed came from large families but either explicitly or implicitly said they did not want to replicate this in their own lives. Anecdotal evidence also suggests that the more educated women are in Namibia, the more likely they are to have smaller families. Thus it appears that, as suggested by one participant, Josef, education is empowering females to take greater control of their reproductive health and family planning. Ultimately, improving the education of females in Namibia may bring benefits in a number of interlinked areas—personal, social, and environmental.

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Namibian pre-service science teachers' perspectives on environmental issues
Perspektywy namibijskich studentów pedagogiki dotyczące kwestii środowiskowych

Streszczenie

Jak wiele krajów na całym świecie, Namibia, poza względnie niewielką populacją i stabilnym rządem, boryka się z poważnymi problemami środowiskowymi. Artykuł przedstawia wyniki badań ukierunkowanych na określenie, w jaki sposób grupa potencjalnie wpływowych studentów trzeciego stopnia pedagogiki postrzega stan środowiska w Namibii. W tym celu przeprowadzono wywiady z grupą 20 przyszłych nauczycieli, aby zbadać ich postrzeganie wyzwań środowiskowych, przed jakimi stoi Namibia. Większa część respondentów stwierdziła, że głównym problemem jest wylesianie. Kojarzyli oni również zagrożenia środowiskowe z erozją, zasoleniem oraz pustynnieniem. Niektóre osoby wskazywały na globalne ocieplenie i powiązane z nim zmiany klimatyczne, kilku studentów uważało, że kraj już cierpi z powodu tych zjawisk. Pomimo że populacja Namibii jest dość niewielka w porównaniu do jej powierzchni, przyszli nauczyciele uznali wzrost liczby ludności za problem zarówno środowiskowy, jak też społeczny. Wszyscy respondenci postrzegali edukację jako klucz do zmniejszenia wielkości rodzin oraz złagodzenia problemów środowiskowych i społecznych. Jednak żaden z uczestników badania nie powiązał degradacji środowiska z umacniającymi się wzorcami konsumpcyjnymi.

Słowa kluczowe: Namibia, studenci pedagogiki, kwestie środowiskowe, wylesienie, zmiany klimatyczne, populacja