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Research Article

Greening the school for sustainable development: Tshwane North District case

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Article Info	Abstract
  	The aim of the study was to answer the question that arises about what knowledge do role players have about sustainable development through greening schools. The research employed qualitative multiple case study design in three purposefully sampled schools at Tshwane North District, Gauteng Province of South Africa. Besides literature review and theoretical framework of sources, the data was collected through focus group interviews, direct observation and document analysis. Data collected was analysed with thematic content analysis. The results revealed that school role players have little knowledge on greening schools to ensure sustainable development; and opportunities and threats need to be addressed by role players. These were attributed by lack of policy framework and capacity building on how greening schools should be implemented. The study recommended creation of an integrative assessment of green schools that embraces practical activity plan on curriculum and infrastructure. Further research studies in the area of greening schools are recommended for effective sustainable development on school resources.

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Introduction

The original work of the field of Environmental Education (EE) embracing sustainable development (SD) was pioneered in the twentieth century by the Stockholm conference (1972). The United Nations Development Programme (UNDP) emphasises SD to be achieved by all member states by 2030. The 17-point sustainable development goals (SDGs) were adopted by United Nations (UN) member states in 2015 (Kariaga et al. 2013, p. 246), due to the failure of most countries to achieve their set of targeted millennium development goals by 2015 (Ogenokokwo, 2017). We are currently in the era of UNDP (2015-2030) and SDGs create a positive image of the future by targeting good living conditions for all by 2030 (Luetkemeier et al. 2021, p. 1). The challenges humanity faces today, especially in the countries of the South Sahara, are unprecedented (Luetkemeier et al. 2021, p. 1). From the South African context, the Constitution of South Africa (SA) emphasised SD and enshrined the right of a healthy environment for all citizens (Act 108, 1996). The Academy of Science of South Africa (ASSAf) report shows that there is no shortage of the South African policy documents that supports the notion of green for SD, namely, the New Growth Path, the National Development Plan (NDP), and the Green Economy Accord, to name but a few (Diab, 2015, p. 1).

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The current Curriculum Assessment Policy Statement (CAPS) has EE topics in all learning areas of the curriculum which supports SD (Department of Basic Education, 2014). Basic needs like air, water, sanitation, energy and food, if they are not met, then the school generation suffers (Le Grange, in Stevenson, et al. 2013, p. 128). The World Decade on Education for Sustainable Development (WSSD, 2005, 2014) proposed a way of signaling that education and learning lie at the heart of approaches to SD (Kariaga, et al. 2013). Based on these global declarations, SA released the NDP: vision 2030, identifying nine challenges the country faces (National Planning Committee, NPC, 2013). Among them is the slow progress on sustainable resources and intensive economy (NPC, 2013, p. 15). This study reminds all leaders and role players of their responsibilities to protect the vulnerable environment we all share through sustainability of resource consumption through SD and greening. Since the fruits of education ripen slowly, the leaders of tomorrow must be educated today by tirelessly reminding all people that they share the same destiny and must unite to protect the planet Earth, whose resources have sometimes been overestimated, and that is the task of education (UNESCO/UNEP, 1978, p. 77).

In SA, the Department of Environmental Affairs (DEA, 2010, p. 4) was given mandatory to ensure that SA effectively manages the environment and natural resources in a manner that ensures economic and social sustainability for current and future generations. Irwin and Lotz-Sisitka (in Loubser, 2014, p. 59) state that the Department of Basic Education (DBE) ensured that every learning area in the school curriculum has an environmental focus embedded in it. Environmental concerns are considered to be one of the main vehicles for teaching EE and education for sustainable development (ESD). Education is at the heart of SD (Loubser, 2014, p. 133). Therefore, ESD is a subset of EE and green school is another way of promoting SD.

Empirical Studies

Over the past decades there has been an increased demand of green schools both is SA and internationally (Wildlife Environment Society of South Africa, WESSA News, 2018). The study by Kerlin, et al, state that a 'green school' is a label given to a school building whose occupants focus on sustainable development with regard to energy consumption (2015). Additionally, they contemplate that it is a building that is wireless, fuel-less, which utilise solar energy power, rainwater catchment, vegetative roofing, geothermal heating and cooling systems primarily for sustaining resources (Kerlin et al. 2015). Similarly, the study of Earthman (2009) and United States Health Report (2015) refer to green schools as high performance and sustainable schools that reduce incidents of illness and absenteeism. A similar study by Hens et al. (2010) was conducted in SA and developed Environmental Management Systems for rating a green school in 39 primary schools in the northern Gauteng and southern Limpopo provinces. In this regard, the conceptual understanding of green schools became the point of focus of this study. Therefore, there is indeed a need for green schools in order to ensure sustainable development that will result in protecting future generations from resource depletion.

Theoretical Framework

Although theories are generally used to explain phenomena or conceptual perspectives (Trafford & Leshem, 2011), this study explored issues experienced by role players at the school in the implementation of SD plans. Aligned to the emphasis on greening school and sustainable development, this study adopted the ecological democracy theory by Kensler (2012), which integrates ecology, democracy and greening school phenomena. Secondly, the sustainability theory (Jenkins, 2009; Department of Environmental Affairs, 2012) to understand how green schools sought to find sustainable consumption patterns in the school ever-growing demand on learner teaching support materials, energy, water and others, since greening schools and sustainable development. Thirdly, the leadership complexity theory (Lichtenstein, et al. 2006; Morrison, 2002) was also adopted since the complexities that arise in the educational endeavour concern not only the physical but also the normative questions of how leaders' responsibility is taken and assigned at school. These theories underpinned the study and enabled to develop an argument that was conceptual.

Research Problem Statement

This study is rooted in and academic interest of the researchers regarding green schools and ESD interests. We experienced depletion of school resources due to the school's lack of knowledge about greening schools. The current study came about when the school experienced periodic and recurring resource depletion especially during the last quarter of the year when learners were about to write their final year examinations. Combining experiences on resource depletion, EE and knowledge, the researchers pursuit this topic to project what might have been accomplished if the school was a green school. Future generations are at risk if the present generation does not take action and efforts to ensure that better environmental learning and actions are sustained and become part of how schools are managed (Ringdahl, 2008, p. 36). Green development is not about the way the environment is managed, but about who has the

power to decide how it is managed (Adams, 2009, p. 379). The school role players have the authority to initiate greening the school (South African Schools Act, 1996). Kensler (citing Ferreira, Ryan & Tilbury, 2006, p. 8) argues that

> *"in their initial training, teachers may learn about sustainability in science, geography, or studies of society and environmental curricula. However, sustainability does not feature in educational leadership, management, psychology or sociology classes, thereby limiting the potential for whole school approaches"* (DE, 2012, p. 794).

Research Questions, Aims and Objectives

The main research question of the study is:

What are the strengths, weaknesses, opportunities and threats in greening the school for sustainable development? The following sub-question unpacked the main research question:

> ➢ What is the nature of the knowledge of the role players in the school about greening the school?

The main aim was to: Explore the strengths, weaknesses, opportunities and threats in greening the school for sustainable development. The objective of this study is to:

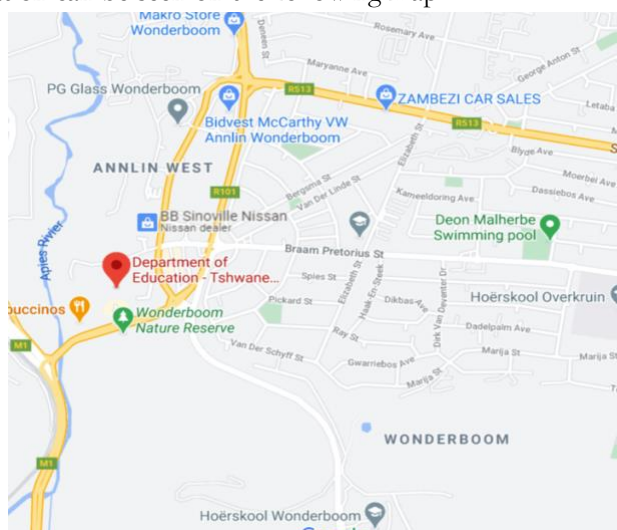> ➢ Examine the nature of knowledge of the role players in the school about greening the school.

Method

Research Design

Informed by the literature review, the research process provided details about two phenomena, namely, greening schools and SD situations which were explored through qualitative multiple case study design to understand the contextual factors that hindered schools to effectively achieve SD. The qualitative and exploratory methods were used since these methods provide significant contributions to both theory and practice (McMillan & Schumacher, 2014, p. 344). To understand how schools implement their respective sustainability practices, we focused on school role players' knowledge of SD and greening schools to identify the strengths, weaknesses, opportunities and threats for greening schools to promote SD. According to Zikmund and Babin (2010, p. 82-84) exploratory research produces qualitative data or is used when new insight is needed to reach an appropriate decision statement and research objectives. We chose the case study design due to its ability to involve issues explored through one or more cases within a bounded system, meaning, setting or same context (Creswell, 2007, p. 73).

Research Location

This research was conducted at three primary schools each from city, township and rural schools of the Department of Basic Education in Tshwane North District. Tshwane North district is located at the Northern direction of the city of Pretoria, the capital city of SA in Gauteng Province. It is bordered by Anlin in the north and Wonderboom town in the south. The research location can be seen on the following map.

Figure 1.

Case study context: Tshwane North District

Retrieved   from: https://www.google.com/maps/place/Department+of+Education+-+Tshwane+North+District+D3/@-25.716748,28.1898713,15z

Participants

Four to six participants from each school were sought from both the school management team (SMT) and school governing body (SGB) members of each participating school. Furthermore, we used purposeful sampling which selected people who are holders of data needed for the study (Maree, 2012, p. 79; Creswell, 2013, p. 156) according to table 1 below:

Table 1.

Components of SMT and SGB Members

SMT	SGB
1.Principal	1.Parents or guardians
2. Deputy principal	2. Teachers
3. Heads of Departments	3. Learners
4. Senior teachers	4. Non-teaching staff
	5. Co-opted members

Source: Education Employment Act, 2007; South African Schools ACT, 2007

Both the SMT and SGB were selected because they are the holders of data needed for the study (Maree, 2012, p. 79; Creswell, 2013, p. 156). The SGB is allocated financial powers, staffing including educators' promotions (South African Schools Act, 1996) and the SMT manage professional matters of the school and resources needed to provide quality teaching and learning (Educators Employment Act, 2007).

Data Collection Tools

The study employed a series of semi-structured focus group interviews in phase one. The structured observation in conjunction with an environmental audit tool and document analysis was phase two of this study, in order to achieve triangulation and increase trustworthiness (Brundrett & Rhodes, 2014, p. 30). Triangulation implies comparing many sources of evidence in order to determine the accuracy of information, a means of cross-checking data to establish its credibility (Briggs et al. 2012, p. 84).

Focus Group Interviews

This study employed web-based focus group interviews using e-mails or internet. Four to six participants per school were interviewed as a group, rather than each person individually (McMillan & Schumacher, 2014, p. 389). The participants debated and argued about the topic to provide interaction on realities as defined in group context; and on interpretations of events that reflect the group input (Frey & Fontana, 1991, p. 175).

Observation

The semi-structured observations were employed in conjunction with an environmental audit tool with questions drawn from green features in the study of Kerlin et al. (2015). The study used items which met the Leadership in Energy and Environmental Design certification standards (Kerlin, et al. 2015).

Document Analysis

The documents analysed were CAPS and the school environmental management policy aimed at providing a larger data base and methodological rigor (Frey & Fotana, 1991, p. 178).

Trustworthiness

Even though the aspects of trustworthiness are separated, they should be viewed as intertwined and interrelated (Graneheim & Lundman, 2004, p. 109). The credibility of the study increased by the researcher's prolonged stay in the field until data saturation. Transferability was enhanced by providing detailed information on the research procedures; and sampling those participants who have the best knowledge regarding the research topic. Dependability was achieved by outlining and discussing in detail the processes of data collection; asking the same questions for all participants in interviews. Confirmability was enhanced by transcribing the interviews verbatim with latent content; allowing field notes on observational data to offer a reliable record that corroborate text interviews and transcripts.

Coding

The coding framework has been decided deductively emanating from the theoretical frameworks from the three theories mentioned above underpinning the study. Data was analysed through thematic content analysis since this analysis is suitable for relatively low level of interpretation, in contrast to grounded theory, in which a higher level of interpretive complexity is required (Vaismoradi, Turunen & Bondas, 2013, p. 399). Five predetermined thematic areas developed by the researcher were used as the unit of analysis in the focus group interview guide to ensure that conclusive results could be made. The researcher transcribed all online and text-based interviews of each participating

school verbatim according to the predetermined themes in the interview guide. Setting code was used to code participating schools as *SC* (city school), *ST* (township school), and *SV* (village school). Participant perspective code was given to every participant in each focus group and coded as *P1, P2, P3*, and so on according to the Table 2 below. Categories coded C1 and C2 emanated from Kensler's theory for describing, explaining and predicting a continuum of development from more traditional schools to green schools (DE, 2012, p. 790). C3 – C6 emanated from the sustainability theory; C7 from the complexity theory and C8 emerged inductively.

Table 2.

Coding of Participants and Cases

Cases and Participants	Codes
City school	SC
Township school	ST
Village school	SV
Participant 1	P1
Participant 2	P2
Participant 3	P3
Participant 4	P4
Participant 5	P5
Participant 6	P6
Category 1 (Ecological principles)	C1
Category 2 (Democratic principles)	C2
Category 3 (Economic)	C3
Category 4 (Social)	C4
Category 5 (Political)	C5
Category 6 (Spiritual)	C6
Category 7 (Complex environmental problems	C7
Category 8 (Biography)	C8

Own source coding analysis, 2020

The transcripts were written in question-by-question format to enable the researcher to capture what each participant in each group had to say regarding each question (Maree, 2012, p. 92) where possible. The group, not the individual was the fundamental unit of analysis (Morgan, 2013, p. 60). Focus groups are not isolated individuals but are engaged in a conversation (Silverman, 2016, p. 176). Therefore, neither the individual nor the group constitutes a separable unit of analysis.

Results and Discussion

The results are presented in threefold, namely: focus group interviews, observations and document analysis of each participating school. Each case is presented as *P1- SC* to *P4 - SC*; *P1 - ST* to *P6 - ST;* and *P1 - SV* to *P5 - SV*.

Focus Group Interview

Theme 1. Sources of School Funding

The results indicated clearly that the role players are knowledgeable about the sources of funding in their schools. This is evident in the statement of all schools who reported government funding (*P4 – SC; P2 – ST*) whereby *SV* reported 100% government funding and non-governmental organisations (*P2 – SV*). *SC* further reported payment of school fund (*P4 – SC*). Another source of funding emanated from fundraising (*P4 – SC; P1- ST*; P2 – SV). These methods of fundraising did not promote green and SD, since learners wore casual clothes on Fridays and donated R2. 00 to the school coffers (*P2- ST*). The fact that all schools needed extra funding, indicated that the schools' basic source of funding was not sufficient to operate efficiently as it was reported that

> "*the school ended-up topping government funding by recruiting different businesses to support the school*" (P5 – SV).

Theme 2. Experience on Resource Depletion

A variety of participants' statements revealed that schools were not self-reliant with resources and there were inconsistencies from government and non-governmental organisations funding which were not reliable. *P1 - SC* stated that:

> "*Parents are persuaded to pay school fees through constant letter reminders and during the Annual General Meetings. However, many of them still struggle to pay or no payment at all is made.*"

P3 – ST stated that they even borrowed resources from neighbouring schools. From all participants, *P5 – SV* singlehandedly disagreed and stated that

> *"schools need proper planning, sharing of ideas, teamwork, time management and making estimates when running fundraising projects."*

Theme 3. Experience of Using School Resources

P1 - SC calls it *"a nightmare",* stating that these resources run out before the expected time. Contrary to that, *P2 - SC* stated:

> *"Sometimes we have to out-source from other schools or request from the SGB for new ones."*

P3 - ST reported that burglary and theft were causing constraints to school resources. In addition, *P2 - SV* stated that they experienced learners who damage or loose books.

Theme 4. Educational Experience on Resource Use

Three participants out of four in *SC* stated that they learnt a lesson about the areas where school expenses were channeled such as furniture, textbooks, photocopiers, infrastructural maintenance etc. (*P1; P2; P4*), whereas *P3* complained that

> *"most teachers did not study Accounting at school."*

Only four participants from all cases reported that they learnt how to use resources sparingly (*P1 - SC;* P4 - *SV*; *P2 - SV* and *P3 - SV*), and only one of the participants highlighted that they improvised where there is shortage of resources (*P2 - SC*). On the other hand, one participant reported that he realised the importance of fundraising and donations because they boost the school income for effective running of the school (*P4 - SC*). However, the results revealed that the lessons learnt by these groups are not green and poses a threat to sustainable resources.

Theme 5. Sustainable Development or Sustainability

Concerning which resources must be sustained, the groups listed a number of resources, namely, infrastructure, natural resources, learner teacher support materials and electricity. The rationale was based on the fact that

> *"they are expensive to replace or service; are the basic needs of the school; they are scarce and valuable"* (*P5 - SV*)

and that resources should be able to cater for future generations (*P4 - SV*).

The Environmental Audit

The results of the environmental audit clearly indicated that all groups were knowledgeable that electricity could be saved on lights and computers. All participants in all groups agreed that water could be saved by harvesting rain water. Only two participants in *ST* are knowledgeable about recycling taking place at school as recyclers came to collect bottles (*P2* and *P4*); whereas *P1* and *P3* indicated that they do not know about recycling; and *P5* and *P6* did not comment about recycling. *SC* and *SV* did not report recycling. Electricity green saving mechanisms were not applied in all cases. This is evident whereby all cases reported that their schools did not use energy saving lights.

Observation Results

The observation schedule revealed the following results per school in Table 3 below:

Table 3.

Observation of School Sites

Criteria	Comments
Were water tanks installed?	Water tanks installed for storing borehole water (*SC*) and harvesting rainwater (*ST*; *SV*).
Were there planting plants programmes?	Trees, lawn and flowers were planted around the building and sports grounds (*SC*); few indigenous plants and flowers (*ST*); there was visibility of more trees, green grass, flower plants, citrus fruits and vegetables (*SV*).
Were there appropriate waste reduction methods?	*SC* used municipality bins for waste removal and office waste paper was shredded and recycled; *ST* sorted waste for recycling; and *SV* composted waste to fertilise the gardens.
Was the school located far from public transport?	In *SC* and *SV* public transportation was far from the school and *ST* was closer to it. There was no land degradation in all cases.

Based on the observations, only SV had efficient managed fruits and vegetable gardens and none at *SC* and *ST*. Irrigation took place in all cases and leaking taps were addressed. All schools were not registered as eco-schools, did not partake in auditing waste or use solar energy. When renovating or building, *ST* and *SV* used local people and *SC* sometimes out-sourced. The air quality was compromised in all cases whereby *SC* and *ST* only used air conditioners in the administration offices but none in the classrooms and no indoors plants in all cases. It was revealed that energy conservation strategies used by the schools were not sufficiently environmentally friendly.

Document Analysis

According to Merriam (1998) the researcher has the authority to judge whether the document is appropriate as a data source by finding out whether the information in the document has information pertinent to the research question and whether it can easily be acquired. CAPS curriculum is the current South African curriculum document which determines which content must be taught and assessed in all school subjects since its implementation in 2012 (DBE, 2014). Table 4 below shed light on the subjects' themes in the curriculum with EE topics which supports SD.

Table 4.

Grade 4, 5, 6 and 7 ESD Content in the Curriculum

Subject	Theme
Natural Science	Water, Energy, Food and Security, Biodiversity,
Social Sciences	Ecology, Natural Resources, Waste and
Life Skills	Pollution, Health, Values, Ethics, Action
Life Orientation	Competence and Careers
Economic and Management Sciences	
Technology	

Adapted from Department of Environmental Affairs (DEA, nd)

It is clear from the table above that ESD was integrated in the curriculum (DEA, nd). One of the general aims of the curriculum which embraced SD is "Human rights, environmental and social justice" (National Curriculum Statement, 2012). It is evident that the DBE made a decision to include ESD in the curriculum. Mathematics and Languages themes were not included since Mathematics is a language that makes symbols and notations to describe numerical, geometrical and graphical relations (CAPS, Mathematics, 2011, p. 8). The results revealed that the concepts "EE, ESD or green" are not mentioned in the curriculum content topics, however, their content is variably integrated in all curricular subjects across the grades. The results revealed that the operational methods on waste management of the schools do not show a positive relationship between curricular content and practice or behavior (DBE, 2014). For example, the curriculum has included water cycles and roles of water in ecosystems and wetlands, but all schools observed do not have any evidence of using harvested water for wetlands where frogs and other species can co-exist. There is no action plan made for direct implementation of environmental topics in the curriculum. The curriculum emphasised content and assessment with no planning of environmental activities evidence. This study further revealed that non-renewable and renewable energy sources and impact topics are in the curriculum, however all schools observed are operating with non-renewable energy sources. Additionally, strategies of implementing green features and SD skills are not suggested in the curriculum.

The curriculum is aimed at promoting cognitive skills for promotional purposes. The focus is on knowledge assessment, since it does not suggest sustainable strategies and implementation is not action-centred. Although knowledge is fundamental in promoting positive sustainable behaviour, CAPS did not provide guidelines for achieving the ability to solve environmental problems. There are no mechanisms established in the curriculum to assess the effectiveness of environmental programmes in the curriculum. In contrast, not all role players are teachers, and not all teachers in the SMT are ESD specialists experienced in the interpretation of ESD content in the learning areas they are teaching and thus they are unable to come up with creative and innovative approaches to develop green and sustainable sites at schools.

Strategies such as fieldwork are hindered by contextual factors such as resources, CAPS policy contradictions and teaching time as stipulated by the curriculum. It appears that there is a gap between the curriculum and role players' job descriptions if they might make efforts to implement SD through the curriculum content. As a result, it would be difficult for role players to identify SD themes in the curriculum and put them into practice.

It is apparent that ESD is not practical, but used as a tool for teaching and learning topics. This could be a reason for poor visibility regarding a variety of environmental and sustainable practices. Furthermore, it is evident that EE or ESD topics were taught only for skills (writing, reading etc.), assessment and promotion purposes.

Although CAPS suggest inquiry-based learning opportunities and suggest that learners do practical tasks regularly, its major assessment objective is knowledge based and continuous assessment (DBE, 2012, p. 62). Although knowledge is fundamental in developing sustainability literacy, CAPS did not inform guidelines for assessment of skill competencies in taking actions towards solving unsustainable environmental problems.

Environmental Policy

Only SV Environmental policy was submitted and provided the following inputs:

The policy was given an effective date of January 2019 and was supposed to be reviewed in September 2020. The preamble was aligned to the Constitution of SA within its Bill of Rights that it provides all citizens with the right "to a healthy environment that is not harmful, protected for the benefit of the present and future generations." The preamble was also aligned to the White Paper on Education and Training (1995) which highlighted EE, involving interdisciplinary approach to learning.

The policy's purpose emphasized:

> ➢ *To improve and include environmental components in the curriculum*
> ➢ *To provide opportunities for learners to study local environmental issues*
> ➢ *To implement an environmentally responsible purchasing policy*
> ➢ *To reduce waste*
> ➢ *To maximise the school's energy efficiency*
> ➢ *To encourage the planting of vegetables at the school*
> ➢ *To optimise and control the use of water at the school."*

The results on the environmental policy revealed that this policy was formulated and signed by SMT and SGB chairpersons. From the researchers' point of view, it is uncertain to verify that all members of the SGB and SMT participated in the formulation of this policy.

The Nature of the Knowledge of the Role Players in the School about Greening the School

From the literature study of greening schools, most studies acknowledge the definition of sustainable development as defined by the Brundtlant report, that it is "development which meets the needs of the present without compromising the ability of future generations to meet their own needs" (Kensler, 2012, p. 792; Ogenokokwo, 2017; Foo, 2013; Loubser, 2014, p. 124). This relates to *P4 - SV*, who asserted that

> *"school resources like buildings and fencing need to be protected because many generations can still make use of them."*

All participants are knowledgeable that the state is the main source of funding according to the national norms and standards for school funding (2018). However, according to the participants in all cases, they acknowledge that these funds are not sufficient to run day-to-day operations of the school. *ST* and *SV* are no-fee paying schools in quintile two and one respectively in accordance with the NDP (NCP, 2013, p. 51) and the official guide to SA in Education (Government Communication and Information System, 2018/19, p. 94). *SC* is in quintile 4 and charges school fees as determined by the SGB according to the South African Schools Act (1996).

The majority of the participants acknowledged that they lack knowledge and experience on challenges to achieve efficient fundraising methods for sustainability of school resources. It is revealed that participants have no knowledge that there are local companies in Tshwane local municipality that provided recycling bins for bottles, paper, plastic and tins. The waste is separated, weighted and schools are reimbursed for waste recycled as observed in *ST*.

SV used green sustainable practices with the food garden. The role players generate sufficient funds by selling organic vegetables to communities. These practices are healthy and reduce incidents of illness and absenteeism (Earthman, 2009, p. 264; US Health Report, 2015). Unfortunately, *ST* would not be able to erect a food garden because of the limited space. It can be easily assumed that *SC* with a large school yard did not understand that vegetables and fruits could be planted, produced and sold locally.

All schools further revealed that they lack knowledge of using a renewable energy source, lights are switched on at night in *ST* and in *SV* and they did not use energy efficient lights. This is aligned to the participants' report that:

> *"Money is depleted by services such as water bills, electricity bills, photocopying machines, paper, stationary, transport for teacher workshops, fuel for the generator"* (P3 - SC).

Furthermore, *SC* revealed that their computers are left in standby mode when not in use. Literature revealed that machines left in standby mode still draw 20% of the power they do when fully operational (Gear, 2009). In addition, *SC* needs to install roof gutters to channel rainwater into water tanks which may be used for irrigation and filling the swimming pool. The swimming pool needs to be covered with a pool cover to also reduce water evaporation, pollution and wastage. However, installation of boreholes in *SC* and *SV* are environmentally and eco-friendly, green, sustainable and reduce unnecessary water bills in to a certain extent.

Strengths, Weaknesses, Opportunities and Threats Analysis on Greening the School Field Notes Results

Exploring greening schools in three schools provided a valuable insight into what the overall strengths, weaknesses, opportunities and threats (SWOT) are regarding sustainable development. The researcher examined areas that shows evidence of positive or best practices and interpreted them as strengths for greening the school. The negative or worst environmental practices are interpreted as weaknesses. Those practices that could guide or provide local planning approaches to achieve sustainable development were interpreted as opportunities. Finally, those practices that were dangerous practices and showed health and safety risks were interpreted as threats. Holistic coding as an exploratory method was used based on what the researcher deductively assumes may be present in the data (Miles et al. 2014). The researcher used deductive thematic content analysis with five pre-determined themes drawn from the South African Green Schools Programme (Bizcommunity, 2017). The start list of themes (in bolded caps font) and then categories numbered *C1 - C10* (in small caps) were provided according to display figure 2 below:

Table 5.

List of Themes and Categories for SWOT Analysis

Theme 1. Waste Management
C1: reduce
C2: reuse
C3: recycle
Theme 2. Energy Efficiency
C4: audits
C5: saving criteria
Theme 3. Water Conservation
C6: rain water harvesting
C7: Irrigation methods
Theme 4. Landscaping Tree Planting & Beautification
C8: carbon offsetting
Theme 5. Institutional Management
C9: instil knowledge and skills
C10: instil awareness

Source: South African Green Schools Programme (Bizcommunity, 2017).

The SWOT results across all cases are summarised according to thematic discussion in Table 5 below:

Table 6.

SWOT Thematic Analysis

Themes	SWOT analysis
Waste management	The results revealed that *SC* did not practice the best waste management methods of reducing, reusing and recycling waste. The question that could be raised as a concern to *SC* is why they have to bury resources in landfill sites that can be used for socio-economic upliftment of the school. *SC* and *SV* did not use efficient sorting of waste materials for recycling. However, *SV* used waste material for organic gardening which was efficiently managed. *ST* implemented effective waste management method whereby recycling bins were sorted at source. Therefore, disposal in landfill site was the least, since waste was used for economic and social upliftment of the school and did not risk the integrity of the environment.
Energy efficiency	The results revealed that all cases used non-renewable energy source which was costly. There was no evidence of site wind power plants or solar panels in all cases which implies high taxation on electricity bills. This induces threats of depleting electrical power and denying future generations to benefit. However, *SV* implemented fossil energy in a form of gas for reducing costs on the school nutrition kitchen stoves and *SC* had a giant generator installed on site to alleviate costs and for backup purposes.
Water conservation	The results indicated that water was conserved in an effective way in all cases, since all water leaks were addressed. *ST* and *SV* installed water tanks to harvested rain water and used this water in different positive ways. *SV* put rain water runoff to good use in irrigation and having fruits and vegetable garden. The negative approach revealed in all cases was that the schools did not create wetland plants from rain water runoffs where learners can identify different species like frogs, birds and insects which can help to improve environmental learning and action through the curriculum. There were also no water reduction methods in all cases through water surveys or audits.
Landscaping, tree planting and beautification	The school' surroundings were used as learning tools and for beautification as more trees including indigenous trees were planted in *ST* and *SV*. This revealed that the outdoor air quality was environmentally healthy and supported the whole local ecosystems and biodiversity conservation within the school. The results also revealed that there were no indigenous medicinal plants in all cases and these deprived learners to learn about the uses of different medicinal plants around their area.
Institutional management	Only *SV* had an environmental management policy which provided the basis on how environmental matters are managed at school. It was very unfortunate that *SC* and *ST* did not have such a policy to be analysed.

Source: South African Green Schools Programme (Bizcommunity, 2017)

Discussion of the SWOT Analysis

Theoretically, this study is environmental in nature, integrating ecological democracy (Kensler, 2012), sustainability (Jenkins, 2009; Department of Environmental Affairs, 2012) and complexity leadership theories in education (Lichtenstein et al. 2006; Morison, 2007). Coded categories were deductively derived directly from these theories underpinning the study, guided by research questions through discovering manifesting patterns of particular expressions of meaning and ideas in the data which allowed for exploration of narratives in the data (Ngulube, 2015, p. 18). Deductive approaches in this study involved using predetermined frameworks to analyse data (Burnard et al. 2008, p. 429).

The strengths on waste management practices were evident in *ST* who cut down on waste by recycling bottles, paper and plastics to reduce waste. The participants in *SC* lacked knowledge that there are local recycling companies in Tshwane local municipality, like Nampak (Ringdahl, 2008, p. 36) and Collect-a-Can that has obtained local and international acclaim for its contribution towards protecting the environment, as well as its significant contribution to job creation and poverty alleviation (official guide to SA in Education, 2018/19, p. 114). Food and garden waste was composted in *SV* and reused for the school garden which sold vegetables to the local community. The role players in *SV* generated extra funds by selling organic vegetables to Tshwane North communities. The findings by Hens et al. revealed that vegetable gardens were used by the schools studied to support their feeding schemes (2010, p. 666). This

resonates with Earthman (2009, p. 264) and the findings by the US Health Report (2015) who state that these practices reduce incidents of illness and absenteeism. *ST* school gate showed "Recycle Here" indicating that the school practices recycling of waste.

There were serious weaknesses and threats whereby all cases used non-renewable energy source. A study by Le Roux (2014, p. 111) reported that an increase in energy demand in SA led to the increase in electricity prices seen yearly. This is aligned to the participants' report during focus groups interviews stating that electricity and electrical appliances extort school finances (*P3 - SC* and *P5 - SV*). This is similar to the study by Tsikra and Andreou (2017, p. 207) stating that using artificial lighting significantly increases the operating costs.

Water conservation strategies were quite remarkable in all cases with few threats. There were water decanters in each class at *ST* and jelly water cans in each class at *SV*. Water tanks were visible in all cases with no visibility of dripping taps. Landscaping by trees, flowers, grass, fruits and vegetables in *SC* and *SV* was physically greening the school and also promoted positive sustainability behaviour. Indigenous trees visible in both cases are cost effective because most of them are drought resistant. This resonates with the findings of Carvello (2009), who established that vegetation supports the ecosystem within a school with curricular benefits on biodiversity study and is also aligned with global SDGs; and Eco-school themes of nature; biodiversity; and healthy living. In addition, plants provide shelter to people and habitats to biodiversity; are home to 80% of terrestrial biodiversity; provide building materials to 300 million people; maintain global climate; are sources of medicines and clean water; and are the lungs of the Earth, which add to the oxygen content of the atmosphere (South African National Biodiversity Institute (SANBI), 2018). Tree planting is supported by the study of Le Roux (2014), who stated that plants should not be overused or exploited, but protected for atmospheric stability. This process improves air quality, provides shade to the school play grounds, reduces water runoff, storm water pollution and improves the appearance of the school. The results in *ST* with limited tree planting pose a health threat which does not align to the Constitution (1996) that gives South Africans the right to a healthy environment that is not harmful to their health or well-being. A study by Kensler (2012, p. 797) revealed that when the environment is not protected, the results are horrifying whirlwinds, record-breaking tornados, coastal flooding, drought and wildfires.

It should be noted that resource management is regulated by legislation at a national level, however implementation does not take place at a national level (Makokotlela, 2016, p. 55) but rather at a grass root level by school policies. Schools need to register as eco-schools with WESSA (2018) and celebrate environmental commemoration days to promote and encourage activism in schools and communities.

Conclusion

In conclusion, education is the best vessel or vehicle to bring about the paradigm shift from unsustainable behaviour to green efficient sustainable schools. Education needs to be at the forefront to lead and fulfill the responsibility of protecting the environment as endorsed by the Constitution. However, the education system cannot achieve positive results if its implementation is done in isolation. All citizens need to be taken on board irrespective of their age, educational and economic backgrounds. Sustainable development and greening need to become a way of life of all South Africans. The current schooling system in South Africa is not yet paperless. There is a trail of e-waste generated from old technology that still needs to be addressed, whereby less than 20% of e-waste is recycled, resulting in global health, environmental risks and loss of scarce and valuable natural material (World Economic Forum Annual Meeting, 2020).

Finally, collective responsibility is an important part of our heritage to survive in the planet Earth. Change to sustainable development and green lifestyles are a global need, it must happen; we cannot ignore or neglect it. Greening and sustainable development in our schools and communities is the only hope to reverse the damage already done to planet Earth.

Recommendations

The following recommendations are suggested:

➢ An introduction of school awareness campaigns on greening schools programmes.
➢ Participation and community empowerment for all role players.
➢ The creation of an integrative assessment of green schools in South Africa that embraces practical activity plan on curriculum and infrastructure.
➢ Research in the area of greening schools in accordance with global sustainable development goals need to increase.

Limitations of the study

The limiting factors are listed below:

➢ The difficulty in finding adequate 8 participants in the focus group interviews.
➢ The collection of data through face-to-face focus group interviews was interrupted by the unprecedented COVID19 pandemic that forced the researchers to use online text-based interviews.
➢ South Africa is a vast country with nine provinces, many races, diverse cultures and religions of valuable research direction that would have been included.

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Appendices

Appendix 1.
The Focus Group Interview Guide

The Focus Group Question Guide

Theme 1. Sources of Funding (Economic)
➢ What processes do you follow in generating money in the school's coffers?
Probing if necessary: school fund, state funds or NGOs.
Is it difficult to generate funds?
Probing: If so, in what ways? How do you deal about it?

Theme 2. Experience When Resources Are Depleted
➢ Tell me about causes of depletion.
➢ During depletion, how do you overcome these constraints/challenges?
➢ How did the DBE and NGOs assist in these matters?

Theme 3. Experience of Using School Resources (How Do You Extort/Deplete Resources On)
➢ LTSM and Equipment;
➢ Infrastructure, behaviour, awareness and attitudes.

Theme 4. Educational Experience on Resource Use
➢ How do you rate your capabilities with regard to sustainability of school resources in the scale of 1-10?
Probe: since most of you are not from entrepreneurship profession.
➢ Ever since you suffered resource depletion/constraints, has your attitudes towards being in the school leadership changed?
Probe: how? In what way?

Theme 5. Sustainable Development/Sustainability
➢ What must be sustained? Why so? How?
Probing: Which goods must be protected? Why so? How?
        What is the rationale of doing so?

Appendix 2.
Environmental Audit Tool

Score	Yes	Sometimes	No	Comments
Are you aware that switching off lights during school hours saves electricity?				
Are you aware that switching computers off after school saves energy?				
Are you aware that rain water harvesting saves water and electricity?				
Do you implement strategies to save water and electricity?				
Do you practice recycling of paper, water, electricity, machines, e-wastes, plastics, bottles, uniform etc?				
Do you make your own food garden, for NSNP or for fundraising?				
Do you use HVL globes at school or CFLs?				
Do you know which materials are recyclable or places where to recycle?				
Do you have a school environmental or green policy?				
Are you registered as a green school or Eco-school?				
Do you audit waste relating to water, paper, energy, travel?				
Do you use renewable energy like solar energy?				
When building or renovating, do you use local people and products?				
Researcher's reflections:				

Appendix 3.

Observation of School Sites

Criteria	Yes	No	Comments
Were water tanks installed to collect rainwater/for water harvesting/use rainwater runoff to good use like creating a wetland in their garden? *SC*		√	Water tanks were installed for storing ground water from the borehole. Rainwater was not harvested and no rainwater runoff were used for good use. No visibility of fountain, garden or wetland
ST	√		Only two tanks available for harvesting rainwater which was used only during municipality water stoppages
SV	√		Rainwater harvested was used to water the gardens and cleaning of classrooms and toilets. There were no wetlands in their gardens
Were there planting plants programme or indigenous fynbos /indigenous medicinal plants at site? *SC*	√		Trees, lawn and flowers were planted around the building and sports grounds. There was visibility of indigenous acacia trees plants and no medicinal plants
ST	√		Some plants are visible with visibility of some indigenous plants and few flower plants. No medicinal plants
SV	√		Trees, green grass and flower plants are planted for shade, beautification, soil erosion prevention and for fundraising especially citrus fruits and vegetables. The latter were also used to support the school nutrition programme. No evidence of medicinal plants
Were there irrigation systems that conserved water and leaking taps addressed? *SC*	√		Leaking taps were not visible and irrigation took place in the mornings to conserve water
ST	√		Irrigation was done in the morning and leaking taps were addressed because learners used water containers available in their respective classes
SV	√		Irrigation was done in the morning and leaking taps were addressed. Water was stored in water containers for all classes for learners
Were there lighting systems that conserve fossil fuels and maximise the use of renewable energy like solar panels or LED lights? *SC*		√	Solar panels were not installed and the lighting systems used were not energy saving lights
ST		√	There was no visibility of energy saving lights and solar panels
SV		√	No evidence of renewable energy system and energy saving lights
Were there appropriate waste reduction methods to minimise landfills and reduce resource depletion? *SC*	√		The school used municipality bins for waste removal. Office waste paper was shredded and recycled

ST	√		Waste was sorted in four waste bins for recycling of bottles, paper, plastic and solid waste
SV	√		Waste bins were used for collection of solid waste to a landfill inside the school yard which was converted to compost to fertilise the gardens. Paper and steal waste from desks were recycled for fundraising purposes. Damaged desks are repaired.
Was the school located far from public transportations to reduce pollution and land degradation? *SC*	√		Public transportation was far from the school, so there was no air, noise, pollution and land degradation
ST		√	Taxis and buses pass in front of the school gate causing noise pollution. There was no land degradation because the roads were tarred
SV	√		The school was not next to public transport and most learners walk to school because they resided in the neighbourhood. Those who were residing far from school, used local transport and lift clubs
Was there an indoor environmental quality that provides occupants with thermal comfort and acoustic, visual and air quality? *SC*		√	They used air conditioners in the administration offices but none in the classrooms or any plants planted indoors
ST		√	Air conditioners were installed only in the administration offices. There were no indoor plants in classes and offices
SV		√	They relied on natural air plants by opening windows to support indoor air for occupants. One class was using an electrical fan and the offices used ceiling mounted fans; no air conditioners installed and no plants planted indoors.

Appendix 4.
Grade 4, 5, 6 and 7 ESD Content in the Curriculum

Subject	Theme	Grade	Content
Natural Science	Water	5 6	Water cycle Water, role of water in ecosystems, wetlands
	Energy	5 6 7	Renewable and non-renewable sources Energy, renewable and non-renewable energy Energy, renewable and non-renewable energy impact
	Biodiversity/ecology	4 5 7	Plant and animal rights, IK in relation to biodiversity Food chains, lifestyles Extinct spaces in SA; biosphere
	Natural resources	4 5	Earthworms, animals and soil Soil erosion
	Waste and pollution	7	Extraction and use of materials, including pollution; sorting and recycling materials; Impact on the environment.
	Values, ethics and action competence	4 6	Caring for plants and animals, animals used by man- value and responsibility to care for them Healthy environment important for the healthy planet
Social Sciences	Water	4 5 7	Water in SA: sources, access, storage, pollution, quality Rivers, activities, dams, rainfall in SA. Water: need, supply and catchments
	Food and security	4	Food and farming in SA
	Biodiversity/ecology	7	Marine reserves
	Natural resources	4 5 7	People and resources Mining and minerals, deforestation Natural resources and conservation in SA
	Waste and pollution	5	Waste disposal
Life Skills	Health	4 6	Personal health and hygiene caring for the environment, caring for animals Beliefs about purpose of life, people, and animals, role of religion: opportunities for volunteering, moral obligations
Life Orientation	Health	7	health and safety
	Values, ethics and action competence		
	Careers		Careers
Economic and Management Sciences	Natural resources	7	Sustainable use of resources
Technology	Waste and pollution	7	How to recycle and use goods to satisfy needs and wants, use of recycled material
	Natural resources	7	Use of natural resources for shelter, food, etc.
	Waste and pollution	7	Recycling scrap metals and design recycling scheme

Adapted from Department of Environmental Affairs (n.d)

Appendix 5.
Document Analysis Tool

Name of Document:
Document Creator:
Date of Analysis:
Data to be analysed:

Development, implementation and monitoring of the policy

➢ Who is involved in the development, implementation and review of the policy?

➢ What actions are taken to meet the aims and objective of the policy?

Curriculum

➢ How is environmental education teaching and learning guided in greening the school in the policy?

➢ What environmental education teaching and learning opportunities are available for learners to promote greening of the school?

➢ What teaching and learning activities around learner projects, fieldworks and curriculum excursions are undertaken by the school to promote greening the school?

➢ What curricula content directly **refer to resource use such as water?**

Sustainable Waste Management Systems

➢ How is the school's waste managed and monitored?

Water Sources

➢ What are school's water sources and how are they managed and monitored to promote sustainability?

Energy Sources and Usage

What are the sources of energy and how are they managed and monitored to promote sustainability?

Transport

Are they promoting sustainable development?

Purchasing PolicyAre they buying from local and green companies?

The outdoor activities