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Research Article

Exploring environmental literacy components in promoting sustainable behaviour: a case study of rural primary schools

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Article Info	Abstract
	This study explored environmental literacy level of both teachers and learners in rural primary schools, with the focus on knowledge, attitude and skills components. The study further examined how the components promote sustainable behavioural change in rural schools. A qualitative multiple case study design, guided by the interpretivist paradigm was employed where three rural primary schools, from Sekhukhune District in Limpopo Province of South Africa were conveniently sampled. Data were collected through observations, document analysis, semi structured and focus group interviews. Three Grade 7 teachers each teaching Social Science, Natural Science and Technology, and 18 learners were purposively sampled to participate in semi structured and focus group interviews. Data were deductively and inductively analysed using content analysis. The findings revealed both nominal and functional environmental literacy levels of both teachers and learners, with limited contribution to sustainable behavioural change. The findings are attributed to teacher's lack of expertise in Environmental Education (EE) content; the limitations of a curricular framework in equally addressing the knowledge, attitude and skills components; and absence of policies and framework guiding sustainable behaviour. The study recommended reorienting and aligning the EE content curriculum with teachers' preservice training; ongoing in-service development and support; and the inclusion of polices that guide lifestyle and practices guiding sustainable behavioural change. This research provided insight into the progress of developing environmental literacy in rural primary schools.

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Introduction

Developing environmental literacy for sustainable development is a global concern with some of its responsibilities bestowed upon formal education, with the purpose of promoting individuals behavioural change towards a more sustainable lifestyles and practices (UNESCO, 2018). The need to develop environmental literacy arose out of concerns about environmental degradation, due to human behaviour globally (Ever, 2012; Msezane, 2017). This includes extensive population growth, increasing consumption patterns, inequality, poverty, the loss of biodiversity, land degradation, the high rate of waste generation and climate change, the list is endless, across developing and developed countries, rural and urban regions alike (Sharma & Rani, 2016). These global crises call for the integration of EE, with the objective of developing an environmental literate citizenry, and promoting behavioural change (UNESCO, 2018).

Environmental Literacy and South Africa

Despite efforts aimed at of introducing and integrating EE in formal education more than two decades ago, studies globally have shown that EE is not achieving its goal of developing environmental literacy in schools (Erdoğan et al. 2009; Kaya & Elster 2019). Most countries still suffer from what could be called an environmental literacy gap which

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appears to be growing rather than shrinking (Huston, 2016). The environmental literacy gap exist not only because of what is being taught by teachers in schools, but because of how the curriculum has been developed and evaluated (Huston, 2016). Schools' inability to provide a basic understanding and skills needed to make informed decisions on people's interactions and their relationship with the natural environment, serve to exacerbates developmental efforts in terms of environmental literacy (Roth, 1992).

South Africa also sought to meet its international obligation to develop an environmentally literate citizenry, by integrating EE content into the school curriculum. The main aim of the Department of Basic Education (DBE) was to infuse the principles and practices of sustainable development (SD), social and environmental justice, and human rights into schools (DBE, 2011). South Africa's' development of environmental literacy is however still a major challenge in both rural and urban schools. The absence of Continuous Assessment Policy Statement (CAPS) enabling guidelines, in teaching EE content and the lack of significant teachers training contribute to this scenario (Loubser et al. 2001; Hebe, 2019). This called for a need to explore the environmental literacy levels in schools, with the focus on knowledge, attitude and skills related competencies, and their effectiveness in developing sustainable behaviour.

Roth (1992), the founder of the concept "environmental literacy", defines it as the person's capacity to perceive and interpret the state of an environmental system as well as the appropriate actions for managing, restoring and improving the system. It is the development of knowledge, attitude and skills components on a continuum that unfolds on the nominal, functional and operational levels (Roth, 1992). It is built on an ecological paradigm and its presence must be defined in terms of observable behaviours (Hungerford & Volk, 1990). Knowledge competencies are regarded as fundamental in developing the environmental literacy of both teachers and learners (Hollweg et al. 2011). Teachers are expected to possess both appropriate and specialised knowledge, and to be able to present that knowledge to learners, using appropriate methods for developing their environmental literacy (Hollweg et al. 2011). Although knowledge is fundamental to the development of environmental literacy, the attitude underlying the whole process requires an intention to take action, which is key to develop skills based competencies (Kidman & Casinader, 2019). The environmental literacy components of knowledge, attitude and skills are required to achieve SD and bring about a sustainable and just society (UNESCO, 2018). People with an acceptable level of environmental literacy should be able change their practices and lifestyles so as to contribute to more sustainable behaviour.

The Importance of the Study

The focus of the study was on rural primary schools as those communities continues to experience numerous socio economic challenges (Saiti et al. 2014). A lack of resources due to poverty, unemployment and high levels of illiteracy continues to entrench inequalities in rural communities thereby limiting any developmental possibilities that might be achieved through education (Saiti et al. 2014; Tsakeni, 2017). Under rural conditions, inhabitants need to find a balance between maintaining sustainable lifestyles and the socio-economic conditions they deal with (Saiti et al. 2014). Therefore, the development of environmental literacy in rural school communities is important in strengthening learners' capabilities and competencies, to adopt behaviours and practices that will counter the environmental challenges their communities are facing.

Empirical Studies

Although the ultimate goal of EE is to develop environmental literacy in schools, the extent body of literature suggest that insufficient emphasis is given to studies on how best to develop environmental literacy in terms of its components, and through behavioural change (Forbes & Zint, 2010). Krnel and Naglic, (2009) highlight the importance of addressing both the knowledge and awareness components of environmental literacy, to produce responsible environmental behaviour in both eco and ordinary schools. Wong et al. (2018) mirror the importance of understanding the components of environmental literacy, their links to pro environmental behaviour, and the factors considered when assessing EE programmes and interventions.

The literature also suggests the importance of teaching and learning strategies in developing environmental literacy in schools. A lack of service learning and practices is deemed to affect the development of environmental literacy in schools (Gbadamosi, 2012). Kidman et al. (2019) also emphasise the importance of inquiry-based practices, and suggest that progressive pedagogies in the form of inquiry -based teaching are foundational in developing learners' environmental literacy. South Africa's failure to develop environmental literacy in schools is attributed to the absence of CAPS in enabling guidelines in teaching EE content, and a lack of significant teacher training (Loubser et al. 2001; Hebe, 2019).

Theoretical Framework

A theoretical framework provides a foundation for literature review, research methods and analysis of any study (Grant & Osanloo, 2014). In this instance, Self-Efficacy theory was selected having originated from the Social Cognitive

Theory of Albert Bandura. Social Cognitive Theory holds that people can learn through observing others, and be motivated to obtain information, gain skills, develop beliefs and adopt strategies through the interrelationship between themselves, their environment and their behaviour (Bandura, 1977). Self-efficacy refers to beliefs about their capability to produce designated levels of performance that exercise an influence over the events affecting their lives (Bandura, 1977). It determines how people think, feel and act through diverse effects including the cognitive, motivational, affection and selection of processes (Dermici & Teksöz, 2017). People's beliefs about their self-efficacy are developed by four main sources of influence, including performance accomplishment/ mastery of experiences, vicarious learning, verbal encouragement, and psychological and emotional states. See figure 1.
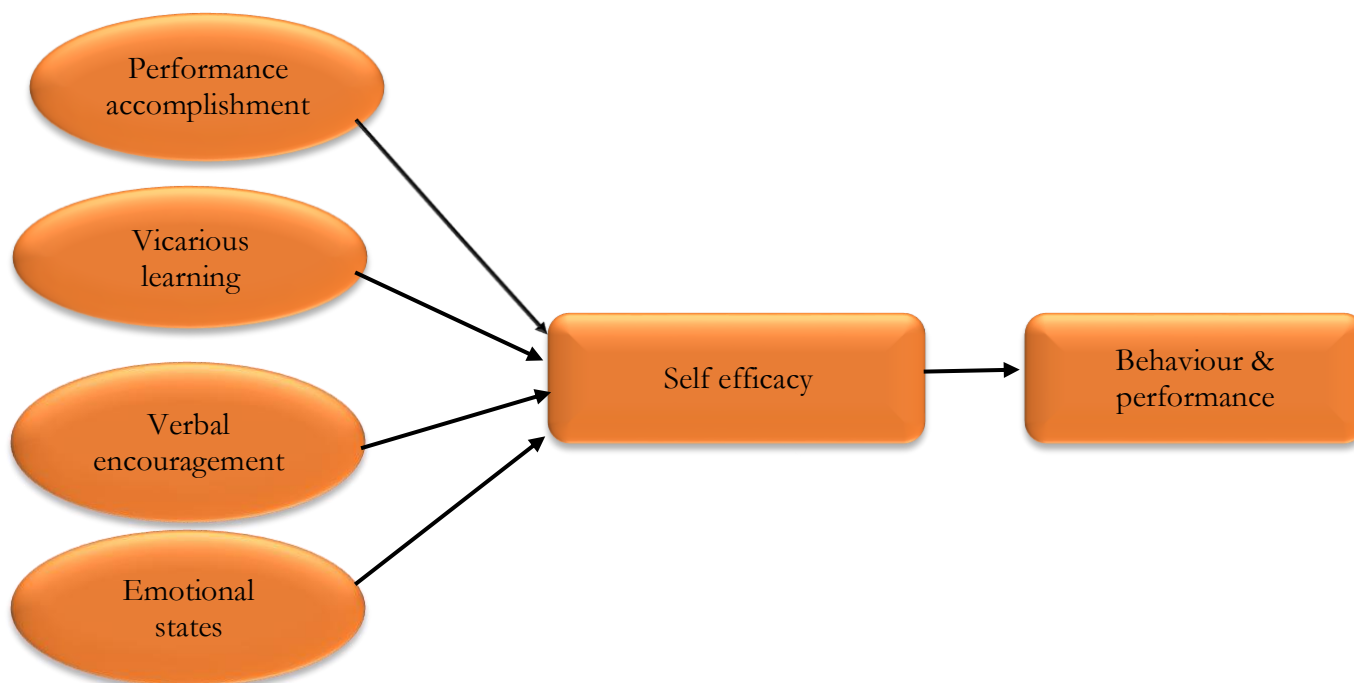

Figure 1.
Components of Self-efficacy (Source: Bandura 1997)

The performance accomplishment or mastery experience was found to be the strong hold for self-efficacy belief (Almashard, 2017). Such experiences relate to a specific area or field, and the skills and practical procedures, used to apply a skill which serves to bring about the expected behavioural change. (Kostadinova, 2013). Teachers with performance accomplishment are expertise in the field of EE. They have acquired knowledge, and skills based competencies in applying a variety of EE approaches, to develop environmental literacy in their learners. They are involved in EE programmes and projects, and apply their skills to solve environmental problems.

Vicarious experience provides a social model which involves seeing people who are similar to one self- succeed. That raises the belief that they one also has ability to master such activities. EE learning for the development of environmental literacy and behavioural change, requires collaborative effort, teamwork and support, to overcome the challenges faced in the course of the process.

Social persuasion in the form of verbal encouragement or incentives motivates people to try harder to succeed, and drives them to perform the desired behaviour. Sustainable behaviour can be encouraged and motivated through support and incentives for engaging in sustainable practices.

Emotional state is associated with the perceived ability to cope with negative emotions, and the ability to organise them (Kastiadinova, 2013). Self-efficacy belief contributes to the motivation process and decisions in respect of behavioural change (Kastiadinova, 2013). The above-mentioned components present a link between environmental literacy and self-efficacy belief. If teachers are not well equipped with knowledge, expertise and experience to teach EE content, they are unlikely to develop confidence or to be motivated to teach the content to develop learner's environmental literacy, and will not have the desire to engage in sustainable practices.

Problem Statement

The study arose out of the authors' interest on the effective development of environmental literacy in rural primary schools. Although EE content is integrated in CAPS subjects, insufficient attention is paid to it, and little support is offered for its implementation, in addition, a lack of resource management is evident. Sikhosana et al. (2020) confirm

that EE is not effectively integrated in teaching and learning processes. Bopape et al. (2021), also highlight lack of support in terms of funding and resources to support the sustainability of school resources. This prompted the researchers' interest in conducting a study, which explores the following main research question:

How effective are the environmental literacy components of knowledge, attitude and skills, in promoting the sustainable behaviour of both teachers and learners in rural primary schools?

The following sub questions assisted in answering the main research question:

- Which EE content knowledge is taught and learnt in rural primary schools?
- How does acquired knowledge lead to positive attitude towards sustainable behavioural change?
- How effective are the skills acquired, in taking action towards solving environmental problems?

Methodology

The methodology guided the plan for generating and analysing data (Creswell, 2014).

Research Design

The aim of the study was to explore the environmental literacy levels of teachers and leaners with the objective of examining their sustainable behaviours. The study employed a qualitative interpretative multiple case study design to provide in-depth, relevant information, understanding and interpretation, of the extent of environmental literacy development in selected South African schools (Yin, 2009; Creswell, 2014). The design allowed for multiple methods of collecting data from different sources, which is important for the triangulation of data, to ascertain the validity of inferences obtained from multiple data sources (McMillan & Schumacher, 2010). The design also allowed the selected content analysis method to explore the differences and similarities amongst cases, in order to compare the environmental literacy levels in schools (Baxter & Jack, 2008).

Research Location

The study was conducted in three primary schools resorting under the DBE, in Sekhukhune District, in Moutse, Limpopo Province, South Africa. The schools are Senior Primary, which caters for learners from Grade R to Grade 7. The location of the schools can be seen in figure 2.

Figure 2.
The Location of Research

Participant Sampling

Three cases were conveniently sampled based on their geographical proximity, to allow easy access and efficiency in terms of time and costs. The population for the study included three Grade 7 teachers and 18 learners. Only teachers who were eligible to teach Natural Sciences, Social Sciences and Technology subjects were purposively sampled, based on the perception that they would hold the rich, relevant information necessary to answer the research questions (Creswell, 2014). Grade 7 learners were sampled because they are at the exit level of primary school, and are perceived to have developed the accepted level of environmental literacy needed to answer the research questions. Pseudonyms were used to ensure the confidentiality and anonymity of cases and participants, for instance C1 for case 1, T1 for teacher 1 and L1-6 for all learners in C1 (Gentles et al. 2015). A total population of 21 participants was sampled for this study.

Data Collection

The study employed document analysis and observations during the first phase and semi structured face-to-face interviews with teachers and focus group interviews with learners during the second phase of the data collection process. The use of these data collection methods assisted with the triangulation and credibility of the collected data (Denzin & Lincoln, 2011). The triangulation of data ascertained the validity of inferences obtained from multiple data sources (Denzin & Lincoln, 2011).

Document Analysis

The CAPS curriculum and schools' environmental policy documents were analysed. The curriculum was analysed to explore the integration of EE content in Technology, Natural Science and Social Science subjects, and how the EE content, pedagogies and assessment are framed and guided. Each schools' environmental policy was supposed to provide insight into the guidelines and framework for implementing EE projects and programmes in schools, the practices and lifestyles that promote the sustainable behavioural change.

Observations

Both field and classroom observations were conducted, to gain insight into, and an understanding of the role which schools played in conservation and the sustainable use of resources.

Semi-Structured Face-to-Face Interviews

Semi-structured face-to-face interviews were conducted with one teacher in each case, to explore their environmental literacy levels. The focus was on the teachers' knowledge of EE content, pedagogical approaches to such content, methods of assessment and the teacher's involvement in EE programmes and projects in schools.

Focus Group Interview

The focus group interviews were conducted with a group of six learners in each case to explore their environmental literacy levels of learners, and to triangulate data obtained from other tools (Rabiee, 2004).

Trustworthiness

The trustworthiness of the study can be enhanced by meeting four criteria including credibility, dependability, transferability and conformability (Denzin & Lincoln, 2011). Credibility was ensured through the use of a multiple case study approach and multiple data-collection methods that provided saturated data (Shenton, 2004). Dependability was achieved by clarifying the main concepts guiding the study, to bring common understanding, and provide full details on the methods and procedures for data collection and analysis (Shenton, 2004). Transferability was enhanced by providing transcripts of the raw data collected to illustrate how themes and categories were developed (Zach, 2006). Conformability was attained through the presentation of raw data, and the use of direct quotes, and by transcribing recorded data verbatim, to present the true feelings and experiences of participants (Shenton, 2004).

Data Analysis

Qualitative content analysis method was employed in analysing, presenting and interpreting data. The researchers were guided by the ability of this method to explore and categorise textual information, and to use predetermined themes to ascertain the patterns of words, their relationships, as well as any similarities or differences (Grbich, 2013). All interview records were transcribed verbatim, guided by pre-determined themes, which, were deductively used to guide the coding of subthemes and categories (Neoendorf, 2019). Subthemes and categories were inductively developed form the data (Vaismoradi et al. 2013). A pre-determined scheme of analysis guided the selection of the relevant data, to maintain consistency and cohesion during the coding processes (Vaismoradi et al. 2013; Ngulube, 2015). The coding process is outlined in table 1:

Table 1.

Coding Process

Aspects	Codes
Case 1	C1
Case 2	C2
Case 3	C2
Teacher 1	T1
Teacher 2	T2
Teacher 3	T3
Learners C1	LC1:1-6
Learners C2	LC2:1-6
Learners C3	LC3:1-6
Themes	1,2,3 etc.
Subtheme	1,2,3 etc.
Categories	C1, C2 C3 etc.
Category aspects	C1A, C1B,C1C etc.

Cases were coded as C1, C2 or C3; teacher participants as T1, T2 or T3; learner participants as LC1:1-6, LC2:1-6, or LC3:1-6. Themes and sub themes were chronologically numbered according to the research questions. Category names were abbreviated as C, and labelled numerically as C1, C2 and C3 etc. Category aspects were further labelled alphabetically as C1A, C1B, CIC, etc.

Table 2.

Coding Process for Semi Structured Face-to-Face Interview

Theme 1:Knowledge	Theme 2: Attitude	Theme 3: Skills	Theme 4: Sustainable behaviour
Sub-theme 1: Specialisation and expertise	**Sub-theme 2:** Value, Respect and commitment	**Sub-theme 3:** Inquiry - based practice	**Sub-theme 4**: Sustainable practices
Categories (C1) C1A: Experience C1B: EE concepts and content. C1C: Content interrelatedness C1D: Knowledge of ecological processes	**Categories (C2)** C2A: Appreciation C2B: Perception C2C: Motivation and Confidence C2D: Development and support	**Categories (C3)** C3A: Identifying environmental problems C3B: Solutions to environmental problems C3C: Assessment practices	**Categories (C4)** C4A: Resources conservation and management. C4B: Policy systems.
Sub theme 2: Pedagogical content **Categories(C1E)** Integrative approach C1F: Assessments			

Table 3.

Coding Process for Focus Group Interview

Theme 1:Knowledge	Theme 2: Attitude	Theme 3: Skills	Theme 4: Sustainable behaviour
Sub theme 1: EE concepts and content.	**Sub-theme 2:** Appreciation and commitment	**Sub-theme 3:** Inquiry-based practice	**Sub-theme** 4: Sustainable practices
Categories (C1) **C1B**: Knowledge of EE concepts. **C3**: Knowledge of ecological processes	**Categories (C2)** **C2A**: Perceptions **C2B**: Personal responsibilities	**Categories (C3)** **C3A**: Identifying environmental problems **C3B**: Solutions to environmental problems **C3C**: Taking responsibility.	**Categories (C4)** **C4A**: Sustainable lifestyle and practices.

Results and Discussion

The results of cases were presented to compare differences and similarities following the findings of the document analysis, observations, Individual semi-structured and focus group interviews across all cases.

Classroom Observations

The finding from the lesson observation revealed a level of uniformity across cases, the learning approach was teacher centred, yet C3 offered learners different opportunities such as gardening, making compost, sorting of waste than C1 and C2 did. Assessment strategies were limited to question and answer-methods, and there was no demonstration of action skills.

Field Observations

Table 4.

Observation Tool

Categories	C1	C2	C3
Landscaping and sustainable food gardening	Some tree plantings, no food gardening.	Few plantings and no food gardening	There is multiple plantings including indigenous medicinal trees, shrubs and flowers. Rain water is channelled to plants, there is a fully functioning food garden.
Waste management	Waste papers are burnt or buried in a pit. No indication of waste recycling.	Waste papers are burnt or buried in the pit. No indication of waste recycling.	Waste papers are burnt or buried in the pit. No indication of waste recycling.
Water saving programs	Borehole water use, no indication of rainwater harvesting, leaking taps.	Borehole water use, learners drink water from buckets, leaking taps, no indication of rainwater harvesting.	Use of boreholes, tap automated and some locked no indication of leakages, no indication of rainwater harvesting.
Energy-saving projects	Some lights are left on, electricity is the only source of energy	High electricity consuming bulbs, solar energy used in the kitchen.	Energy saving bulbs are used, electricity is the only source of energy.
EE projects and Programmes	No indication of EE projects or programmes	No indication of EE projects or programmes	There is an organic compost project on site.

The field observation findings from C1 and C2 showed a lack of conservations, and no sustainable use of resources. The absence of sustainable practices, the lack of EE projects and programmes suggested a lack of knowledge of the EE processes and skills necessary for developing environmental literacy. The observation findings of C3 suggest some knowledge and understanding of the importance of conservation and the sustainable use of resources, which constitutes an acceptable level of environmental literacy.

Document Analysis

CAPS curriculum analysis for Natural Science, Social Science and Technology for grades 7-9 revealed that EE content was integrated to varying degrees across the subjects, while the concept of EE is not mentioned in the curriculum. . The curriculum suggests both theoretical and practical assessment activities which teachers can use to assess learners including, (but not limited to) reading, investigating, illustrating, making use of scenarios, case studies, projects, etc. (DBE, 2011). Notably, no explicit reference is made to the pedagogical methods and skills teachers should use to teach the integrated EE content. This argument was drawn from the statement that "content and the associated concepts must be integrated with the aims and skills across all subjects" (DBE, 2011). It was seemingly left to teachers' expertise, experience and their own interpretations to effectively integrate EE content in developing learners' environmental literacy.

The intention behind analysing each school environmental policy was to explore how it provides a framework for planning and coordinating EE projects and programmes, and how it complements the CAPS curriculum in developing environmental literacy in schools. Unfortunately, no School Environmental Policy was available in any of the cases, but in C3, the garden project was guided by Green Gardens policy. The absence of a school environmental policy suggested that there were no frameworks to guide practices or entrench a lifestyle aimed at promoting sustainable behaviour.

Table 5.

Semi Structured Interviews with Teachers

Theme 1**.** *Knowledge.*

Interview questions	Responses
C1A: Knowledge of EE content Have you received any pre and in service, training on EE related content? What is your understanding of EE as a concept and its content?	**T1**: No workshop or in-service training have been conducted." **T2**: No. **T3**: My pre service included environmental science. I also attended a UNISA course on gardening **T2**: CAPS is not extensive in teaching EE in technology.
C1B:Content interrelatedness How are the subjects you are teaching linked to EE content?	**T1**: In social science, the Geography part talks about pollution. **T2**: In Technology, they talk about recycling and safety. **T3**: In Technology, they talk about material and their composition.
C1C Ecological content and processes How does your actions affect the natural environment?	**T3**: When we burn the papers there is a lot of carbon dioxide that is going into the atmosphere and is going to form global warming and cause acid rain. **T3**: There are microorganisms living in water and they get affected by pollution.
	T1: Burning of waste affects us. **T2**: There are other natural things which becomes extinct.

The findings on Theme 1 revealed that teachers portrayed both basic and adequate knowledge of EE content. On C1A, the responses of T1 and T2 denoted that they had received no training on EE content. T3s' responses showed that she had received pre and in-service training on EE content. On C1B, T1 and T2 were aware of EE related content in their subjects but seemed not to be aware of the concept of EE. They confused EE-related content with the concept "environment". Similarly, the CAPS curriculum do not make mention of the concept "EE". Therefore, teachers' background in terms of pre and in-service training on EE is important to understand the concept EE as a process of learning about the environment and its other components, its specialised and distinctive approaches (Dhull,

&Verma 2017). T3 portrayed more knowledge of ecological concepts and processes than T1 and T2 did. The ecological concepts and processes were found to be key to the development of teacher's environmental literacy and that of learners (Hollweg et al. 2011)

Table 6.

Subtheme 2: Pedagogical Content

Interview questions	Responses
C1E: Integrative approach How is EE content guided in the CAPS curriculum?	**T1**: CAPS documents encourages an integrative approach. That brings additional content in our subjects. **T2**: I was not putting much emphasis on environmental content, I was putting much emphasis on solving technological problems related to technology not getting much into EE content. **T3**: CAPS is not saying much about EE, but only its content.
How do you integrate EE content in your subjects?	**T1**: Now I am aware that my EE integration to my subjects is not as it should be. This study has opened my eyes. **T2**: Teachers must be trained in teaching EE content to develop the environmental literacy of learners. **T3**: I include projects like compost manufacturing, gardening, using case study on dangers of animals feeding on plastics. The projects, however, waste time which is needed to finish the syllabus on my subjects.
C1F: Assessments How do you assess EE competencies of learners?	**T1**: Actually, honestly we are assessing knowledge; we are not focussing much on the practical part. **T2**: Our EE activities are knowledge based. We only do projects in Technology. **T3**: Our assessment is knowledge based. We also do projects such as compost and gardening.

The findings on C1E indicated that teachers were aware of EE content integration in the CAPS curriculum, but that they identified EE content as being supplementary to their subjects. T1 and T2 indicated that they did not effectively integrate EE content in their subjects, but focused more on their subject content. These findings highlights the participating teachers' lack of curriculum content knowledge on an interdisciplinary approach, and appropriate skills for effectively implementing EE content in lessons, aimed at developing environmental literacy in learners (Fundisa for Change, 2013). T3 used different integrative approaches to teach EE content including projects and case studies but, regarded such approaches as a waste of time preventing her from concluding the subject syllabus. The C1F findings revealed that assessments on EE content were knowledge based, but T3 reported including EE practical assessments. The findings on C1E highlighted the need for teachers' development in terms of an interdisciplinary approach to the CAPS curriculum.

Table 7.

Theme 2. Attitude

Interview questions	Responses
C2A: Perception What is your perception on teaching EE content in your subject?	**T1**: It is important. We encourage learners not to litter. Those who come late to school pick up litter. **T2**: It is important, learners clean the surrounding when they come late. **T3**: I am tasking the learners to pick up waste.
C2B: Motivation and Confidence How motivated and confident are you in teaching EE content	**T1**: I can be confident and motivated if I am capacitated. **T2**: The motivation is there but I am not confident like when I teach my own subjects. **T3**: I am very much confident, but it comes with lot of work.
C2C: Support How are you supported in effectively teaching EE content?	**T1:** As a principal, I am not supported and therefore, I cannot support teachers. **T2**: No, I am not supported, sometimes we don't understand these EE issues and their projects. **T3**: People from Loskop sometimes do practicals with us and they donate trees.

The findings on C2A showed that participants were aware of the importance of teaching EE content in schools. This indicated a positive attitude but they seemed to be using EE activities as a disciplinary measure against learners rather than developing an attitude of care and protection for the environment (NAAEE, 2012). Understanding and making diverse use of EE activities can internalise the character of caring for the natural environment (Arent et al. 2020). CB2's findings showed the participants' confidence in teaching their subjects but revealed that they were not equally confident about teaching EE content. If teachers are motivated to teach EE content, motivation will guide their persistence and performance, and build their confidence (Mbatha, 2015). The C2C responses also showed that schools were not given much support to effectively implement EE content. Support, in the form of resources and development in EE, will provide teachers with strategies and approaches to broaden their teaching experiences while enhancing learning opportunities for learners in developing environmental literacy (Rosenburg et al. 2009).

Table 8.

Theme 3: Skills

Interview questions	Responses
C3A: Identifying environmental problems Which environmental problems does your schools experience, and what are the causes?	**T1**: I have acknowledged that we have a problem with littering, children are littering around." **T2**: We practise air pollution everyday by burning waste. **T3**: Waste is our big problem, we are burning waste, we have a problem with pampers littering in the community and animals are eating them.
C3B: Solving environmental problems How do solve identified environmental problems?	**T1**: With recycling practically, we failed, because there are financial disadvantages instead of benefits. Our hands are tied. We just encourage learners to pick up papers. **T2**: Recycling of waste is expensive, there are no recycling centres around us. **T3**: We encourage reusing and recycling although is expensive.

From the C3A responses, evidently the study participants could identify environmental problems, and were aware of their actions that harmed the environment, but CB3 showed some socio economic limitations in solving environmental problems. The ability to identify environmental problems can persuade individuals to participate in decision making aimed to solving those identified problems (Ever, 2012). The responses also showed that although the participants could identify environmental problems, their skills based competencies and their socio economic

conditions limited their ability to address the environmental problems affecting their schools and the surrounding communities.

Table 9.
Theme 4: Sustainable Behaviour

Interview questions	Responses
C4A: Sustainable practices and lifestyle Do you have vegetable gardens?	**T1**: We had a vegetable garden, which we have ceased because of water shortages. **T2**: Our vegetable garden was functional last year, this year we had some challenges and the pressure of time. **T3**: We do have a functioning vegetable garden. We went for a gardening course, the principal and myself we won R30 000 to improve our gardens.
How do you manage your waste?	**T1**: On waste management, with recycling we have practically failed because we are working at a loss. **T2**: The waste is not beneficial to the school, we have organised people who are coming to collect our waste. **T3**: We send some waste for recycling. Other papers we just burn them every day to avoid spreading. We make compost with our green waste.
How do you manage and conserve your water?	**T1**: With water, we try to use taps that automatically close. **T2**: With water saving, we have buckets in each class and we do not allow learners to continuously go to the compounds. **T3**: We have some reservoirs to channel runoff, plant indigenous trees; use kettles to irrigate plants and use automated taps.
How do you manage and conserve your electricity?	**T1**: In the kitchen we use firewood, we are still waiting for the electrification of the kitchen. **T2**: We have just installed solar, we were using firewood and it became scarce. **T3**: We use a gas stove and sometimes firewood. We use energy saving bulbs.
How do you manage your school grounds?	**T1:** Our grounds are cleared, we have few trees because of lack of water. **T2**: We try to clear the grounds, we sometimes burn the shrubs, we have few trees that provide shade. **T3**: Loskop people donate us trees, we plant indigenous trees and shrubs that attract and host insects, bees and butterflies.
Which EE activities are you involved in e.g. EE calendar days?	**T1:** We are aware of some but they are not observed **T2:** Actually, let me say we do not do anything. **T3:** We observe heritage day, water week etc.
C4B: Policy systems How do you encourage conservation and sustainable ethics in school?	**T1:** Actually we don't, I think we need to have a policy to practice all this things. **T2**: We really don't have any. **T3**: Its just us with our innovative ideas and the love for nature.
C4B: Barriers and challenges What are your challenges of managing resources?	**T1**: Some of the things we cannot do them, because of our rural context. Like recycling, it is difficult for us to implement it, because it's expensive." **T2**: We had a vegetable garden, but because of pressures of time it ceased. **T3**: Unavailability of training and support

The findings of the above theme showed that sustainable practices were not effective, especially in C1 and C2, which led to less sustainable lifestyle changes. In cases where sustainable practices were implemented, it was for

convenience, and not to sustain resources, and were further not guided by any policies i.e. (switching from firewood to solar energy because of firewood scarcity). The participants were seemingly unaware of economic gains of managing and saving resources. C3 also had problems with managing waste but stated that some resource sustainability were practiced, and there were indications of lifestyle changes. The participants reported collaborating with other stakeholders to observe and honour important environmental days. Environmental literacy is observed through people's practices and lifestyle, which are core competencies of sustainable behaviour (Leicht et al. 2018).

Focus Group Interviews.
Table 11.
Theme1: Knowledge

Interview questions	Responses
C1A: Knowledge and understanding of EE content Have you learnt anything about the natural environment and if so, in which subject have you learnt it from?	**C1, L1**: is like things that are on nature that we use, Life Orientation, from Social Science. **C2, L3**: We once heard about it in Grade 6, They said is recycling, from Technology. **C3, L1**: The areas that we live in, atmosphere, temperatures, water, climate…from social science.
C1B: EE concepts Which EE themes have you learnt about?	**C1, L4**: Water pollution, diseases, littering. **C2, L6**: Pollution, littering, **C3, L2**: We learnt about reuse, recycling, pollution, ecosystems, land and atmosphere, and diseases.
C1C Ecological content and processes The following concepts were asked about to explore ecological processes: Atmosphere, pollution, erosion, climate change, ecosystem,	**C1, L5**: Climate change is the heating of weather. **C2, L3**: Climate change is this thing that they call a blanket, that protects us from the sun. **C3, L5:** Ecosystem is where other things depend on each other, like humans depend on animals, animals depend on plants depend on sun and water.

The responses of C1, L1 and C2, L3 on C1A showed that they learnt EE content in some of their subjects, but their knowledge and understanding were limited. C3, L1 showed embedded EE knowledge and understanding and knew how to apply the knowledge. On C1B, C1:L4 and C1:L6 showed knowledge of EE content but the knowledge was foundational and limited, as guided by the Grade 7 CAPS curriculum. C3, L2 portrayed extended knowledge of a variety of EE concepts, in line with the prescripts of CAPS curriculum. The C1 and C2 further portrayed unorganised and fractured knowledge of ecological processes, which means the learners were limited in terms of fully understanding the importance of ecological processes in their lives. C3:L5 responses showed in-depth knowledge and understanding as well as organised ideas on ecological processes, which are fundamental for the development of environmental literacy (Hollweg et al. 2013).

Table 12.
Theme 2: Attitude

Interview questions	Responses
C2A: Appreciation How important is the natural environment?	**C1, L4**: It is important, it gives us food. **C2, L3**: Our parents plant vegetables and food that we eat. **C3, L4**: It is important, it gives us food, provides animals with shelter, water, the air we breathe, it gives us life.
C2B: Perception How do you take care of the natural environment? Do you love taking care of the environment?	**C1, L3**: We pick up litter, it is a punishment when we come late. I don't like it, because people mock us. **C2, L4**: We pick up litter and burn it. **C3, L1 & 5**: We pick up litter, water the garden and trees, make compost. We love taking care of our environment.

C1, L4 and C2, L2 showed some sense of appreciation for and awareness of, the importance of the natural environment but their perception of picking up litter revealed their negative attitude towards good practices of care and protection which are necessary for inculcating action skills. C3, L1 & 5 showed an extended sense of appreciation and awareness of the importance of the natural environment. They engaged in activities that provided care and

protection for nature. A positive attitude can foster willingness to commit to take responsibility, by taking actions and caring for, and protecting the environment (Veisi et al. 2018).

Table 13.

Theme 3: Skills

Interview questions	Responses
C3A: Identifying environmental problems Which environmental problems have you identified in your surrounding?	**C1, L6**: Papers in the school yard. **C2, L2**: Cows eating plastics and pampers. **C3, L4**: Burning of waste causing air pollution, cutting of trees for firewood.
C3B: Taking responsibility. Who is responsible for those problems	**C1, L3**: Us **C2, L5**: People who have cows and those who litter in the streets. **C3, L2**: The government and us.
C3B: Suggesting environmental problems How would you solve identified problem?	**C1,L3**: Stop littering start planting trees **C2, L2**: People should not throw plastics and papers in the street. **C3, L1**: Government should provide dustbins, recycling, reusing waste, planting more trees.

The participating learners' responses showed that they were able to identify environmental problems in their surroundings, as well as sources of the problems and to provide solution. The ablity to identify environmental problems, evaluate and analyse those problems, and offer solutions, are what makes for an environmentally literate person (Hollweg et al. 2011). The C3 participants showed broader grasp on how to solve environmental problems than C1 and C2 participants.

Table 14.

Theme 4: Sustainable Behaviour

Interview questions	Responses
C4A: Sustainability lifestyle and practices How are you involved in school gardens and managing the ground?	**C1, L4**: There is no garden. Mr Maila is taking care of the grounds. **C2, L3**: We were watering the garden when we come late. The garden is dead now **C3, L1**: We water the garden, make compost.
How do you assist in managing water?	**C1, L2**: We use buckets to drink water, some learners drink from the tap. **C2, L5**: We do not wash our plates at the tap. **C3, L2**: We use a kettle when irrigating plants.
How do you assist in saving electricity?	**C1,L1**: By cooking with fuelwood **C2, L6**: We are not responsible for electricity. The school is, they bought solar. **C3, L1 &6**: We switch off lights, appliances when not in use.
In which EE projects do you participate?	**C1, L1**: We do not have projects. **C2, 3 & 5**: We do technology projects, **C3, 1, 2 & 6**: We make compost; make clothes with waste materials for competitions.

The C1 and C2 learner participant's responses showed limited sustainability related practices to guide and improve their behaviour. The C3 paricipants' responses showed that those learners were fully engaged in the necessary sustainability activities to guide their practices and lifestyle towards sustainable behavioural change.

Summary of Findings

The findings were presented in line with the three working levels of environmental literacy; the nominal, functional and operational levels (Roth, 1992). The nominal level requires a person to have rudimentary knowledge of natural systems, of how humans interact with them, environmental awareness and sensitivity with increased respect for nature. The functional level requires a broader knowledge and increased understanding of human and environmental interactions; greater awareness of, and concern for, negative human interactions; more developed skills to analyse, evaluate, and communicate feelings about environmental problems; and greater willingness to take actions to solve those problems. At the operational level, individuals demonstrate a strong and ongoing sense of investment in, and responsibility for, preventing and remediating behaviour, and routinely take actions that work to sustain and enhance healthy environments (Roth, 1992).

The findings placed both the C1 and C2 teachers and learners on the nominal level of environmental literacy. The observations revealed limited integrative teaching and learning approaches and few of the sustainable practices necessary to promote behavioural change. The findings of document analysis revealed the absence of a school environmental policy to guide environmental practices and shape lifestyles. The interviews revealed that, in both cases, the participants' EE content knowledge and ecological processes were rudimentary, which reflected their limited foundational competencies for developing environmental literacy (Ever, 2012). The participating teachers were also found to have limited pedagogical knowledge to teach integrated EE content, to effectively develop the environmental literacy of their learners. The findings revealed that the participating teacher lacked the performance of accomplishment component of Self-Efficacy.

The performance of accomplishment is the cornerstone for the development of teacher's expertise in the field of EE content, and in terms of the skills based competencies required to implement the integrated EE curriculum for the development of learners' environmental literacy (Bandura, 1977). The participants showed some sense of appreciation for the natural environment, but lacked persuasion, confidence, motivation, and support, to engage in actions aimed at providing care for, and protection to the environmental aspects, which are imperative for developing a positive towards sustainable practices and lifestyles. The participants also lacked vicarious experience, and the social persuasion component of self-efficacy. Sustainable behaviour change must be encouraged and motivated through support and incentives for engaging in sustainable practices.

As regards to C3, the findings placed both the teachers and the learners on an operational level of environmental literacy which can facilitate the development of skills based competencies and the expected behavioural change. The observations findings suggested that all participants had knowledge about, and an understanding of the importance of conservation and the sustainable use of resources. Although there was no environmental school policy, the garden project was guided by Green Garden policy (DEA, 2018). The participants were found to have in-depth EE content knowledge, its concepts and understanding of ecological processes. The findings matched that of the performance accomplishment component of self-efficacy. The teacher was an expert in the field of EE, portraying knowledge and skills based competencies which could help to develop learners' environmental literacy. These participants were also found to be appreciative of the natural environment, and were persuaded to engage in activities that provided care and protection of the environment. The participants were further found to have acceptable levels of skills based competencies, and engage in more sustainable programmes and projects, all of which are necessary to support the development of environmental literacy, and bring about behavioural change. They showed acceptable levels of vicarious experience, and social persuasion components of self-efficacy that encouraged them to engage in sustainable practices. Notably, the absence or existence of environmental literacy is often reflected by observable behaviour (Roth, 1992).

Conclusions

It is apparent from the findings reported on here, that the desired goal of EE to develop environmental literacy in schools has not reached the accepted level of promoting behavioural change across the board. The finding shows that challenges in developing environmental literacy do not solely emanate from teachers and schools, but from a lack of, and inconstant systems and policies aimed at guiding the implementation of EE, and a lack of teachers' development and support. The lack of environmental literacy competencies also affected the development of a self-efficacy belief which is vital for developing confidence and motivating individuals to work towards sustainable behavioural change (Almashard, 2017). Thus to improve environmental literacy in schools, policy systems guiding EE implementation should be clear in terms of guiding the content, and support should be given to practices which are necessary for developing environmental literacy and promoting sustainable behaviour in schools. The EE content curriculum, and

the teachers who teach EE content, are fundamental in developing environmental literacy and resource sustainability in schools (Songqwaru 2012; Kidman & Casinader 2018). Ongoing professional development and support that provides guidance on best practices, are enablers for developing environmental literacy and resource sustainability in schools (Ever, 2012).

Recommendations

Environmental literacy in schools can be improved by aligning the EE content curriculum with teachers' professional development, and strengthening teachers' ongoing development and support to build their expertise in terms of EE content. To that end, it is important to mandate the inclusion of frameworks and policies that guide sustainable lifestyles and practices, to encourage the development of sustainable behaviour in schools.

Limitations of Study

Due to time constrains, the study was conducted with Grade 7 teachers and learners in the Senior Phase, who provided in-depth information in answering the questions in the interview schedule. The study could have been conducted in the entire Senior Phase to provide a full report on the progress being made in developing environmental literacy within a phase. The study was conducted in rural primary schools. If urban and semi urban primary schools had been included, it would have provided a fuller picture of the effective development of environmental literacy across primary schools in South Africa

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