

The assessment of environmental education concepts and skills in Grade 10 Geography

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ABSTRACT

Sustainable development and environmental crises have been recognised globally as relevant to education and teaching. This research explores opportunities and challenges to assess environmental education content, skills and values in the latest Grade 10 Geography curriculum policy document in South Africa. Geography has been lauded as the ideal vehicle to raise awareness and to sensitise learners to environmental issues. The subject's curriculum contains the best opportunities to address environmental and sustainability issues. However, it is unclear whether teachers develop and assess the skills and values needed by learners to identify environmental issues and to solve them. Qualitative research was undertaken with data collected through document analysis and interviews were held with purposively selected participants. The findings reveal that though there are ideal opportunities to develop environmental skills and competences through assessment, these are not realised in practice. The teachers involved in the research have inadequate knowledge of the concept 'environment' and limited familiarity with appropriate pedagogical approaches. Recommendations are made to address the identified shortcomings.

Keywords: assessment of environmental education, assessing education for sustainable development, environmental skills assessment, geography curriculum

INTRODUCTION

Environmental crises and sustainable development challenges are recognised globally as important and relevant to education and schooling (Anderson & Strecker, 2012). Claims have been made about the contribution of geography education to environmental education (EE). Tilbury (1997: 108) argues that geography

which studies the interactions between humans and the physical environment, contributes to an understanding of processes affecting the environment and encourages an interest in the management and protection (of the environment). Most significantly, environmental problems have a spatial dimension, which makes a geographical understanding crucial to environmental education.

This claim is informed by the International Geographical Union Commission on Geographical Education (IGU-CGE), which regards geography as an important vehicle through which EE can be taught (IGU-CGE, 1992). Raselimo (2017) concurs stating that the subject is also appropriate for Education for Sustainable Development (ESD) given its interdisciplinary nature, which entails integrating natural and social sciences. Gritzner (2007) describes geography as the study of 'what is where, why it is there and why people should care'. According to Al Mamun, Jackson and White (2015: 28) the implication of

Gritzner's description of geography is that it is 'a methodology, a unique way of organising and analysing information pertaining to the location, distribution, pattern, and interactions of the varied physical and human features of Earth's surface'. The reference to human interaction and physical and human features reflects the further specialisation in geography, namely 'environmental' or 'human-environment geography', which is an emerging science that uses geography's perspective and knowledge to study environmental issues (Leng, Lin, Yang et al., 2017). In sum, geography is a science that investigates the mutual interaction between humans and their environment.

The themes of the United Nations Decade of Education for Sustainable Development (UNDESD) 2005- 2014 (UNESCO, 2005) are similar to geography's intentions and are related to major issues in the contemporary world. Haubrich, Reinfried and Schleicher (2007: 246) elaborate further, referring to

issues concerning humankind and nature that are important for life, for appropriate spatial behaviour and sustainable behaviour. Themes such as global warming, energy depletion, overuse of non- renewable resources, population change, and global disparities can be used. Consideration of conflicts resulting from contradictory targets concerning environmental, economic and social sustainability is appropriate.

As far as geography education is concerned, nearly all themes highlighted by UNDESD are relevant. Consequently 'the paradigm of sustainable development should be integrated into the teaching of geography at all levels and in all regions of the world' (Haubrich, Reinfried & Schleicher, 2007: 243). Accordingly, the South African Geography curriculum policy document provides an enabling framework to implement EE and sustainable development through the geography curriculum for the Further Education and Training (FET) band. This band provides learners, generally aged between 15 and 18 years, with vocational education and training in the South African context. EE and sustainability are reflected in the geography curriculum policy document by one of the goals in this particular band, namely to teach knowledge, skills, attitudes and values required for more sustainable lifestyles (Department of Basic Education, 2011). This is substantiated by Dube (2012) who identified sustainable development as a central theme in secondary school geography and that it incorporates inquiry learning and issue-based approaches to implement ESD. For example, Grade 10 learners (15-16 year-olds) are expected to identify, plan and provide strategies for solving various environmental issues, such as ways to reduce ozone depletion; attitudes to migrants and refugees; strategies for managing the world's oceans; strategies to reduce the impact of earthquakes and the sustainable use of water, acknowledging the role of government and of each individual (Department of Basic Education, 2011).

Given the enabling curriculum policy framework to teach EE and ESD knowledge, skills and attitudes, the following questions arise: Do teachers create opportunities to assess EE and ESD when teaching geography? If so, does this assessment relate to the mastery of the skills needed by learners to solve the environmental issues referred to earlier? The subsequent discussion focuses on EE and ESD and the geography curriculum document.

EE AND ESD IN THE GEOGRAPHY CURRICULUM POLICY DOCUMENT

As mentioned previously, the geography curriculum aims to develop in learners a commitment

towards sustainable development by enabling them to make informed decisions about social and environmental

issues (Department of Basic Education, 2011). The curriculum policy document therefore encourages teachers to develop the values and ethics needed for a more just and sustainable world. However, teaching about the environment can be challenging as the issues are complex and environmental information is often contested. For instance, the Grade 10 Geography curriculum expects teachers to teach and assess environmental topics such as global warming, focusing on evidence, causes and consequences with reference to Africa, and the impact of climate and climate change on Africa's environment and people (Department of Basic Education, 2011). It is uncertain whether South African teachers have the required knowledge and skills to address these environmental topics in their teaching. This concern, particularly as regards climate change literacy, stimulated Anyanwu and Le Grange (2017) to research teacher variables on the climate change literacy of geography teachers. Their findings reflected that characteristics such as gender, age, teaching experience and teaching grade significantly influence the climate change literacy of geography teachers. The authors recommended continuing professional development programmes to enhance literacy because through climate change education, learners could be empowered to contribute to the sustainable development goals. A study by Yavetz, Goldman & Pe'er (2014) on the perceptions of pre-service teachers of the environment and its relevance to their teaching revealed that the prospective teachers had an inadequate understanding of the concept 'environment'. Though all acknowledged the importance of EE and ESD as part of their future function as teachers, they did not consider humans as part of the environment, nor did they view the environment as a complex web of interactions between people, man-made systems or natural ecosystems. The uncertain or inadequate mastery of knowledge of environmental topics pose a challenge, as teachers may not necessarily know how to go about teaching these topics. Furthermore, as the environment is constantly changing; the knowledge about it also changes. This implies that environmental knowledge is not static but dynamic - what is true today about the environment may not be true tomorrow. As Blyth and Meiring (2017: 4) point out 'even seasoned climate change scientists cannot claim complete knowledge of the complex systems at work'. Teachers may not be adequately prepared if they are not empowered to interpret and implement the curriculum due to inadequate pedagogical content knowledge, reiterating the importance of professional development programmes.

Dube (2012) asserts that research on the implementation of EE and ESD in the FET band, appears to have been neglected, despite the fact that 'environment' and 'sustainability' feature prominently in the geography curriculum. Most recent research focuses on the implementation of EE in the General Education Training band (learners aged between 5-15 years), particularly in the Foundation Phase (learners aged 5-9 years) (Blyth & Meiring, 2017) and the Intermediate and Senior Phases (learners aged 10-15 years) (Schudel, 2014). The FET band was the last to implement the latest curriculum, which contains environmental content and requires that learners engage actively with complex social and ecological concepts, issues and risks relating to local and global contexts. Learners are required to develop an understanding of social and ecological change processes, and therefore need actively to conceptualise and prepare themselves for action, or engage in action-oriented learning processes (Fundisa for Change, 2013; Tal, 2005). Geography can play a leading role in providing knowledge, skills, attitudes and values required to address environmental sustainability through a subject-based curriculum (Catling, Willy & Butler, 2013). However, because of the holistic nature of EE, it is important not only to focus on the

content mastery of EE, but to consider all domains of learning (Gayford, 1998; Marques, Vilches, Gil-Pérez, Praia & Thompson, 2008; Tal, 2005), namely, the cognitive, psychomotor and affective domains to be discussed in the next section.

The content, learning environments and teaching methods used in EE to reach cognitive, affective, and behavioural goals require an appropriate assessment framework (Tal, 2005). The teaching methods include classroom-based and outdoor learning, project-based learning using multiple resources and learning about socio-scientific controversies. For valid assessment of these methods, a suitable assessment programme

that reflects and acknowledges the various settings and learning situations is required. Research on the assessment of EE and ESD skills and competences as offered in the geography curriculum have not been extensively researched in South Africa. Though there is ample literature available on EE assessment (Hsu & Roth, 1998; Stern, Powell & Hill, 2014; Stevenson, Brody, Dillon & Wals, 2014) and of assessment of geography teaching and learning (Bradford & O'Connell, 1998; Butt, 2016; Leat, 2016), little is available on the assessment of skills that could be mastered through the latest geography curriculum in a particular grade to determine whether learners have acquired the knowledge and action skills 'that enable successful task performance and problem solving with respect to real-world sustainability problems, challenges and opportunities' (Azeiteiro, Bacelar-Nicolau & Caetano, 2015: 310).

ASSESSMENT OF DOMAINS OF LEARNING IN GEOGRAPHY

Geography incorporates exploring and acquiring knowledge, skills, values and attitudes that may be used to recognise the interrelationship between people and their environment (Komane, 2005). EE should therefore address the cognitive, ethics/value and affective domains of students (Åhlberg, Äänismaa & Dillon, 2005). As mentioned earlier, EE is holistic and as such includes all domains of learning. The cognitive domain is the most commonly taught and assessed by educational objectives and includes a range of intellectual activities such as memorising, interpreting, applying knowledge, solving problems, reasoning, analysing, thinking critically and evaluating. Virtually all tests that learners write in school are intended to measure one or more of these abilities. Learners may achieve varying levels of cognition in learning about the environment from basic knowledge about an environmental issue to more complex levels such as analysing causes and sources of the particular environmental issue and developing a strategy to solve the problem.

The geography curriculum document suggests that examinations and tests should cater for a range of cognitive levels ranging from lower to higher order (Department of Basic Education, 2011) and weighs cognitive levels in the Grade 10 Geography curriculum as follows: 40% lower order (knowledge and remembering); 40% middle order (understanding and applying) and 20% higher order (analysing, synthesising and evaluating). Consideration should be given to each level during assessment and evaluation practices. For Marcinkowski (1997: 168), cognitive skills include 'skills for investigating environmental problems and issues, including identification, analysis, and evaluation; and skills for dealing with action strategies, including their appropriate selection and planning, implementation, and evaluation of discrete action'. The latter reference to action strategies and implementation seem to link more with the psychomotor domain, which involves motor skills, coordination and physical action skills, but as cognitive abilities are required, the distinction between the various domains of learning becomes diffuse. Teaching and learning strategies that focus on the development of higher order thinking skills should involve learners in activities that result in caring for the environment through participation in ESD

projects that require learning in all domains.

The psychomotor domain is the learning domain that focuses on physical and manipulative activities, and as mentioned in the preceding discussion, links closely with those in the cognitive domain. These activities include drawing maps, taking measurements in the field and conducting interviews. A further combination of the cognitive and psychomotor domains, where research and communication skills are intertwined is proposed by Corney and Middleton (1996) who suggest that learners can give presentations to different groups of people on important local environmental issues. Learners can be encouraged to write letters to the press about their environmental concerns, or contact environmental groups. A further possibility is direct local action such as improving the school environment, initiating more sustainable practices in school or cleaning a polluted area near the school. This is best assessed subjectively through observation, but presentations and the results of psychomotor activities can be assessed objectively. Involvement with real problems or issues is one of the most effective ways to develop action skills needed to investigate, evaluate and implement solutions to problems (Tilbury, 1995). This suggests that it is not enough to encourage learners to make judgements; they have to be equipped with a variety of action skills to participate in the resolution of these problems. It is not merely about discussing solutions in order to enhance awareness, but it is also about an active exploration of issues that necessitates identifying potential solutions and acting upon them (Oulton & Scott, 1992). Accordingly, 'action-orientated' refers to both the various modes of environmental participation developed by EE and ESD as well as the active learning styles employed in the study of environmental and development problems.

The affective domain involves feelings, attitudes, interests, preferences, values and emotions and according to the geography curriculum, the affective domain constitutes a 20% weighting of assessment practices in the FET (Department of Basic Education, 2011). Marcinkowski (1997: 168) recognises affective skills as reflective of 'valuing, organising values into systems, integrating values into a worldview of ethics, and acting according to these'. EE is committed to involving learners actively in the resolution of environmental and development issues to enable them to develop the awareness and moral commitment to ensure sustainability (Tilbury, 1995). Issue investigation is used as a context for the exploration of moral, social and political values required for the development of an environmental ethic. Through issue-based learning for example, learners can acquire EE knowledge, skills and abilities to address environmental problems and values.

The intention of the latest curriculum policy document is to produce learners that are able to identify and solve problems and make decisions using critical and creative thinking through 'active and critical learning: encouraging an active and critical approach to learning, rather than rote and uncritical learning of given truths' (Department of Basic Education, 2011: 4). Being informed about the environment and having a positive attitude towards the environment is not enough to resolve environmental problems. For people to be able to act upon their knowledge and awareness they need to become active in constructing knowledge and become acquainted with a variety of action skills to carry out a solution. Wilmot (2017) reports on recent research on how to integrate ESD in school geography using issue-based enquiry, which facilitates the development of action skills. Through professional development initiatives the teachers involved in the research managed to acquire the necessary knowledge and abilities to integrate ESD in the classroom through an enquiry-based approach. Focusing on the action perspective implies that as part of the learning process learners prepare and take action together with their teachers to solve or counteract the environmental problems with which they are faced (Wals, 1990). This action-oriented approach focuses on the development of learners' ability to act and bring about

changes, which is especially important in ESD and cannot only be assessed through tests and examinations.

RESEARCH PROBLEM

The discussion thus far focused on the value of geography to teach EE and ESD knowledge, skills and attitudes and relevant assessment to determine the mastery of these. This research aims to determine whether selected teachers create opportunities to assess EE and ESD domains present in the Grade 10 Geography curriculum and to examine opportunities and methods that teachers use to enhance ESD through assessment.

METHODOLOGY

A qualitative research approach was followed within the interpretivist paradigm to understand assessment practices of teacher participants. Maree (2011: 60) asserts that an interpretivist research paradigm in qualitative research enables one to 'offer a perspective of a situation and to analyse the situation under study to provide insights into the way in which a particular group of people makes sense of their situation or the phenomena they encounter.

The research context is Grade 10, the first year in the FET band. Three secondary schools in a particular district in Gauteng Province in South Africa constitute the case study. The schools selected through purposeful sampling, were representative of the socio-economic and the socio-cultural context of public schools in the district. The selected participants, two from each school, had taught Grade 10 Geography and had more than ten years' teaching experience. The six participants were the most experienced geography teachers in the district and taught in diverse schools, meeting the needs of this preliminary study.

Data were generated through document analysis of the geography curriculum policy document, and of formal assessment instruments (tests and examinations) developed by the selected teachers. Semi-structured face-to-face interviews were held with each of the teachers. The interviews focused on the teachers' knowledge of EE and ESD and of assessment strategies; teachers' efforts to integrate ESD skills in teaching; preferred assessment strategies; possible constraining factors that prevent authentic assessment and assessment support structures that assist the teachers. The interview data offered contrasting and interesting lived experiences and nuanced perspectives of the environmental concerns in the curriculum, especially of assessment practices in geography. Interview data were analysed manually using Colaizzi's (1978) method of analysis, an acknowledged method of data analysis (Sanders, 2014). This entailed reading and re-reading the transcripts, highlighting significant phrases and sentences from which meanings were formulated. From these meanings common themes were identified. Each of the themes were discussed and substantiated by verbatim quotes. The participants were given pseudonyms to observe the ethical consideration of anonymity and, for the same reason, the identity of the schools is not revealed.

MAIN FINDINGS

The findings of the document analysis of the geography curriculum policy document and assessment instruments (such as tests, examinations and projects) are reported first, followed by a discussion of the themes that were identified from the data analysis of the face-to-face interviews with the participants.

Document analyses

Keeping the discussion of the literature in mind, the FET Geography curriculum policy document was analysed in terms of integration of EE and ESD. The document provides an enabling policy framework with many opportunities to incorporate EE and ESD and to determine learners' skills and abilities through assessment. It suggests strategies that are useful to implement EE and ESD, such as the issues-based approach, the development of critical thinking skills and enquiry-based teaching and learning. The issue-based approach is encouraged in the geography curriculum policy document as the term 'issues' is used in its preamble: Geographical learning aims at 'developing a commitment towards sustainable development' and 'making and justifying informed decisions and judgments about social and environmental issues' (Department of Basic Education, 2011: 8) and geographical skills for 'identifying questions and issues'; processing, interpreting and evaluating collected data; 'making decisions and judgements' and 'suggesting solutions to problems' (Department of Basic Education, 2011: 9). Furthermore, issues and challenges are frequently referred to in the content of Grades 10 to 12. 'Issues' or 'questions' refer to environmental problems: problems affecting the biophysical environment, issues with democracy, human rights and social justice that result from human-environmental interactions, values, action and personal responsibility. Fieldwork, which is recommended in the geography curriculum, can be used as part of the enquiry learning process (Department of Basic Education, 2011). The document also suggests strategies to assess ESD by means of data handling tasks, map work tasks, tests, examinations, case studies and issue-based research projects.

The preceding analysis of the geography curriculum policy document shows that environmental concerns are incorporated in the aims, skills, attitudes and values of the document. The orientation to 'environment' and 'sustainability' is described in the explanation on what geography is and this section emphasises the practice of specific skills to identify issues, make decisions and work either co-operatively or independently to solve problems.

Analysis of instruments teachers use to assess learners

The analysis of examples of assessment instruments used by teachers revealed that the assessment tasks mostly expect learners to define terms and label diagrams, thus focusing on lower order cognitive learning. The majority of the assessment questions do not prepare learners for analysing and evaluating information as required by the curriculum policy document. For example, the curriculum requires that learners should be able to write a paragraph of 10-12 lines, but there was no evidence in any of the tests or examinations that learners were expected to write a paragraph about any issue in preparation for summative assessment. The questions in the assessment instruments should offer learners more exposure to assessment on all levels of all the domains of learning. There are questions about sustainable use of resources related to population structure, growth and movement, as required by the curriculum. One question, for example, requires learners to discuss possible measures that may be implemented to decrease India's population growth rate and to outline the challenges that would likely be faced in doing so. This question encourages learners to find solutions to address a particular issue, but there is no evidence of questions or activities that address other cognitive abilities such as analysis, synthesis and evaluation. According to the curriculum document, the suggested weighting of high order skills should form 20% of assessment tasks, but this was not evident in the documents that were analysed.

Though the curriculum document mentions values specifically for inclusion in questions, the analysis of assessment instruments revealed that the teachers provide few opportunities for the assessment of environmental values and attitudes. Values compatible with a sustainable way of living are a set of values, the implementation of which promote the shift towards a sustainable future as contained in

the Earth Charter and Caring for the Earth (IUCN, UNEP & WWF, 1991). A lack of emphasis on the assessment of values in these assessment instruments suggests a focus on cognitive aspects of learning as opposed to affective learning. It is not enough to acquire concepts; it is necessary to learn to put them into action, integrate them and use them adequately under different real-life circumstances. From the analysis of the assessment instruments it appears as though the teachers do not know how to formulate questions that assess values and attitudes because these had not been assessed in previous curricula. The teachers may be unsure about how to assess learners' viewpoints, which highlights a further need for professional development initiatives.

Interview findings

Teachers' perceptions of the concept 'environment'

The interview analysis revealed that most of the participants are of the opinion that the environment only consists of the biophysical component that excludes the human dimension (social, political and economic dimensions).

Environment is an area around us - that's my understanding of the concept of environment (P1C).

That is your immediate surroundings, yes, your immediate surroundings, everywhere, that's your environment (P2B).

However, one participant had a more holistic, balanced concept of the environment.

[O]ur subject geography is actually the best in 'environment' because I always tell my learners that the best textbook is the environment; we cannot teach geography away from the environment be it physical, social, economic, and so on (P1A).

The fact that most of the participants consider only the biophysical dimension as the environment is disconcerting. They consider EE as synonymous with conservation education, which mainly focuses on the teaching of knowledge and protection of the physical environment. The general perception is that assessment determines knowledge of environmental issues so learners should know about environmental issues. The participants seem to focus on 'fostering awareness by communicating information about environmental issues' (O'Donoghue, 1993: 29) as key to EE and ESD. This view has implications on the pedagogical approach that is likely to be used by the participants.

Teachers' perceptions of EE and ESD assessment

The interview data analysis revealed that the majority of participants consider using fieldwork research projects as the most appropriate method to assess whether learners have mastered ESD competences in geography. All the participant teachers described how they teach ESD and EE topics by referring to experiential learning (practical work) in which learners are taken outside the classroom to observe environmental issues in their immediate and natural surroundings.

Three of the six participants strongly support the use of research projects to assess EE. One participant indicated that learners

can be involved...in different types of projects where they can show their skills, understanding and values, which concern the environment or they can be involved in a number of programmes that are run by the municipality or the school as a whole (P1A).

A second participant mentioned taking learners outside to focus their attention on areas where waste is dumped and to take pictures.

The pictures will serve to see (sic) the extent to which the environment is being polluted...they describe the pictures that will serve as evidence (P1B).

Neither of these participants focused on problem-solving skills when doing the projects, but the third one did.

Learners can go out and find the solution of a problem...they can ask questions (like) what is the major cause of an environmental problem in my area and can find a solution to the problem (P2A).

Fieldwork is an integral part of the enquiry method because it enables learners to go out and find information on questions that relate to particular environmental issues. According to the interview data, case studies or scenarios are also popular for the assessment. This is substantiated by Participant 2B who considers case studies and research as appropriate assessment methods because learners 'do fieldwork and gain real life experience'. A second participant uses the question-and-answer method to introduce learners to a case study followed by a possible research project

...so we're looking at three different types of assessment to make learners aware and to educate them (P2B).

ESD was pronounced in the comment of another participant:

I'd like to give an example. Maybe you look at lifestyle in rural areas where women are the ones who have to take care of the land; they have to make sure that kids go to school; and they collect water like in the past...and then questions will be based on (the case study) specifically...let's say development (P1C).

The interview data analyses suggest that participants are of the opinion that EE requires hands-on or practical assessment even though it is particularly suited to 'process' assessment when it is concerned with awareness, skills and the formation of attitudes and values.

Assessment strategies

Further discussions with the teachers revealed that they are not adequately equipped with the necessary pedagogical skills to assist their learners to engage in making and substantiating decisions about social and environmental issues. Only two participants consider using creative assessment activities with learners such as debates to argue and provide their own points of view about topical issues such as water pollution.

Remember we spoke about conflicting issues that leave a lot of room for debate, and this is

good to use in class, but it's a bit difficult if learners don't have much information (P2C).

As I said before, learners need to do more projects...recycling, vegetable farming and they can also maybe do debates (P1A).

According to the geography curriculum policy document, assessment tasks need to include the ability to evaluate arguments and express and support a particular point of view. Debates would be ideal to develop these higher order skills. In addition, the research task that forms part of the assessment programme for Grade 10 learners (as prescribed by the curriculum), could also be used in 'applying communication, thinking, practical and social skills' (Department of Basic Education, 2011: 9). When asked about the research task, the participants indicated that they have an option to choose their own research topic.

They are optional but we use the exemplars...maybe they should just be examples. We can write our own but it must be on the same standard or better and this is difficult (P1C).

All the teachers in the three participating schools opted for the same research project on refugees, which is developed by the provincial team of subject advisors. The research project on refugees is issue-based and it is designed so that learners can obtain factual information from library books, newspapers and the internet. It provides learners with an opportunity to identify and investigate an issue and suggest solutions to the issue. The participants could not provide evidence that their learners are '[e]valuating arguments, expressing and/or supporting or disagreeing with a point of view with substantiation' (Department of Basic Education, 2011: 54). The research or essays are implemented in a teacher-centred way and assesses knowledge at the expense of action competence, attitudes and values required for responsible environmental behaviour as stipulated in the curriculum.

Perceived barriers

While the policy provides an enabling framework, the participants indicated that they face a number of challenges or barriers. These include difficulties in developing the assessment tasks that assess affective skills. The standardised assessment tasks aim to enhance the regulation of assessment and provide exemplars of best practices to be used in the schools to improve the quality of assessment, but teachers are disempowered as they are unable to develop their own assessment tasks blaming their workload.

I think it's because of these great changes in the curriculum over the last 9 years...we don't have time to develop our own assessment tasks because of time (P1B).

The (curriculum) document is strong on content and leaves little time for us to be creative and get learners to embark on projects (P2A).

The deduction from the comments of the participants is that they tend to focus on covering the prescribed content and only assess environmental knowledge in examinations. Consequently, there is not enough time to focus on the development of skills, attitudes and values. The participants also highlighted barriers that hinder assessing fieldwork activities such as large classes and inadequate financial support to purchase learning and teaching support materials that could promote environmental learning and assessment.

RECOMMENDATIONS

As environmental concerns are often complex and contested, teachers need to be trained to design and develop assessment tasks that encourage critical thinking and analysis of topics at different cognitive levels and in different contexts. Only if the teachers have the know-how will learners be able to engage critically in using geographical skills to address environmental issues.

Secondly, the geography curriculum document should provide exemplary assessment practice resources that could expand teachers' current practices. The assessment resources should include various alternative assessment tools, such as observation, recording and learner diaries that could be used to evaluate changes in attitudes and values.

Thirdly, since fieldwork is part of the geography curriculum requirements, it is recommended that the fieldwork activities should be formally assessed. The assessment of values requires enough time for learners to be exposed to the environment and embark on environmental activities. In support of this recommendation an extensive practical fieldwork research project is proposed, which should be carried out in stages throughout the year. This would allow for the development of environmental values and research skills such as working with primary data; exploration of biophysical, geographical fieldwork; experience in the natural environment and community problem-solving that form the essence of EE and ESD at all levels.

Finally, partnership with environmental education stakeholders such as environmental centres should be strengthened to provide professional support and continuous professional development opportunities for teachers.

CONCLUSION

The inclusion of the environmental and social justice principles as well as the sustainable development concepts in the geography curriculum policy document provides an enabling framework for environmental assessment. However, this research has shown that the assessment of the required skills and values is not successful because of a number of concerns. These include teachers' inadequate knowledge of the concept 'environment' and limited familiarity with appropriate pedagogical approaches. Unless this is rectified, the gap between the intended and the enacted curriculum will remain. Teachers should use a variety of assessment instruments such as encouraging learners to write reports or reflections of what they learn to ascertain whether learners have developed the commitment and ability to get involved in addressing environmental issues. It is apparent that in-service as well as pre-service teacher training programmes should focus on 'how' to teach and assess EE and ESD

and not merely on the 'what' referring to content knowledge.

The lack of emphasis on assessing affective skills and action competences is attributed to a shortcoming in the conceptualisation of environmental learning in curriculum, and needs to be considered critically in teacher development programmes. Professional development for geography teachers should include current environmental issues and assessment of EE-related action competence and values. It remains a challenge to implement a curriculum that will facilitate the holistic assessment of EE

REFERENCES

- Åhlberg, M., Äänismaa, P. & Dillon, P. (2005) 'Education for sustainable living: Integrating theory, practice, design and development' *Scandinavian Journal of Educational Research* 49(2) pp.167-185.
- Al Mamun, M.R., Jackson, T. & White, G. (2015) 'Does the geography major fit in STEM?' *Journal of Geography and Geology* 7(1) pp.27-34. <http://dx.doi.org/10.5539/jgg.v7n1p27>
- Anderson, A. & Strecker, M. (2012) 'Sustainable development: A case for education' *Environment* November-December. <http://www.environmentmagazine.org/Archives/Back%20Issues/2012/November-December%202012/sustainable-full.html> (Accessed 20 October 20).
- Anyanwu, R. & Le Grange, L. (2017) 'The influence of teacher variables on climate change science literacy of geography teachers in the Western Cape, South Africa' *International Research in Geographical and Environmental Education* 26(3) pp.193-206.
- Azeiteiro, U.M., Bacelar-Nicolau, P. & Caetano, F.J.P. (2015) 'Education for sustainable development through e-learning in higher education: Experiences from Portugal' *Journal of Cleaner Production* 106 pp.308-319.
- Blyth, C. & Meiring, R. (2017) 'A posthumanist approach to environmental education in South Africa: Implications for teachers, teacher development, and teacher training programs' *Teacher Development* 21 pp.1-19. <http://dx.doi.org/10.1080/13664530.2017.1327883>
- Bradford, M. & O'Connell, C. (1998) *Assessment in Geography*. Geography Discipline Network (GDN), Cheltenham: Cheltenham & Gloucester College of Higher Education.
- Butt, G. (2016) 'The place of assessment in geographical education' In C. Fisher & T. Binns (Eds.) *Issues in Geography Teaching* pp.234-244. London: Routledge.
- Catling, S., Willy, T. & Butler, J. (2013) *Teaching primary geography for Australian schools*. Victoria: Hawker Brownlow Education.
- Colaizzi, P. (1978) 'Psychological research as the phenomenologists view it' In R. Valle & M. King (Eds.) *Existential-phenomenological alternatives for Psychology* pp.48-71. New York: Oxford University Press.
- Corney, G. & Middleton, N. (1996) 'Teaching environmental issues in schools and higher education' In E.M. Rawling & R.A. Daugherty (Eds.) *Geography in the 21st century* pp.322-338. New York: John Wiley & Sons.

Department of Basic Education. (2011) *Curriculum and Assessment Policy Statement (CAPS) Further Education and Training Phase Grades 10-12: Geography*. Pretoria: Government Printer.

Dube, C. (2012) *Implementing education for sustainable development: The role of geography in South African secondary schools*. Unpublished PhD dissertation, Department of Curriculum Studies, University of Stellenbosch, South Africa.

Fundisa for Change Programme. (2013) *Introductory Core Text*. Environmental Learning Research Centre. Grahamstown: Rhodes University, South Africa.

.....

Gayford, C. (1998) 'The perspective of science teachers in relation to current thinking about environmental education' *Research in Science and Technological Education* 16(2) pp.101-113.

Gritzner, C.F. (2007) 'What is where, why there, and why care?' *Journal of Geography* 101(1) pp.38-40. <http://dx.doi.org/10.1080/00221340208978465>

Haubrich, H., Reinfried, S. & Schleicher, Y. (2007) *Lucerne declaration on geographical education for sustainable development*. Lucerne: IGU-CGE.

Hsu, S.J. & Roth, R.E. (1998) 'An assessment of environmental literacy and analysis of predictors of responsible environmental behaviour held by secondary teachers in the Hualien area of Taiwan' *Environmental education research* 4(3) pp.229-249.

IGU-CGE (International Geographic Union Commission on Geographical Education). (1992) *International Charter on Geographical Education*. Brisbane: IGU-CGE.

IUCN, UNEP & WWF. (1991) *Caring for the earth: A strategy for sustainable living*....London: Earthscan.
Komane, F.N. (2005) *The assessment of environmental awareness of the secondary school learners in the ...Mabopane District*. Unpublished Mini-dissertation. University of North-West, Potchefstroom, South Africa.

Leat, D. (2016) 'The importance of "big" concepts and skills in learning geography' In C. Fisher & T. Binns (Eds.) *Issues in Geography Teaching* pp.137-151. London: Routledge.

Leng S., Lin, C., Yang, Y., Guo, Z., Zheng, Y., Yang, L. & Li, B. (2017) 'Environmental geography' In S. Leng, X. Gao, T. Pei et al. (Eds.) *The Geographical Sciences during 1986-2015* pp.167-202. Singapore: Springer.

Marcinkowski, T. (1997) 'Assessment in environmental education' In R.J. Wilke (Ed.) *Environmental education teacher resource handbook: A practical guide for K-12 environmental education* pp.143-197. Thousand Oaks: Corwin Press.

Maree, K. (2011) *First steps in research*. Pretoria: Van Schaik.

Marques, L., Vilches, A., Gil-Pérez, D., Praia, J. & Thompson, D. (2008) 'The current planetary crisis: A missing dimension in science education' In U.M. Azeteiro, F. Gonçalves, R. Pereira, M.J. Pereira, W. Leal-Filho, & F. Morgado (Eds.) *Science and environmental education. Towards the integration of Science Education, Experimental Science Activities and Environmental Education* pp.25-47. Frankfurt: Peter Lang.

- O'Donoghue, R.B. (1993) *Environment, development and education*. Howick, South Africa: Sharenet. Oulton, C.R. & Scott, W.A.H. (1992) 'The inter-dependence of environmental education, economic and industrial understanding, and the other cross-curricular themes within the school curriculum' *International Journal of Environmental Education and Information* 11(1) pp.1-10.
- Raselimo, M. (2017) 'Situating the Lesotho secondary school geography in curriculum relevance debate' *International Research in Geographical and Environmental Education* 26(2) pp.121-134.
- Sanders, C. (2014) 'Application of Colaizzi's method: Interpretation of an auditable decision trail by a novice researcher' *Contemporary Nurse* 14(3) pp.292-302. ...
- Schudel, I. (2014) 'Exploring a knowledge-focused trajectory for researching environmental learning in the South African Curriculum' *South African Journal of Environmental Education* 30 pp.96-117.
- Stern, M.J., Powell, R.B. & Hill, D. (2014) 'Environmental education program evaluation in the new millennium: What do we measure and what have we learned?' *Environmental Education Research* 20(5) pp.581-611.
- Stevenson, R.B., Brody, M., Dillon, J. & Wals, A.E. (2014) *International handbook of research on environmental education*. London: Routledge.
- Tal, T. (2005) 'Implementing multiple assessment modes in an interdisciplinary environmental education course' *Environmental Education Research* 11(5) pp.575-601.
- Tilbury, D. (1995) 'Environmental education for sustainability: Defining a new focus of environmental education in the 1990s' *Environmental Education Research* 1(2) pp.195-212.
- Tilbury, D. (1997) 'Environmental education and development education: Teaching geography for a sustainable world' In D. Tilbury & M. Williams. (Eds.) *Teaching and Learning Geography* pp.105-116. London: Routledge.
- UNESCO (United Nations Educational, Scientific and Cultural Organisation). (2005) *Decade of Education for Sustainable Development 2005-2014*. Draft International Implementation Scheme. <http://unesdoc.unesco.org/images/0013/001399/139937e.pdf> (Accessed 22 April 2016).
- Wals, A.E. (1990) 'Education in action: A community problem-solving program for schools' *Journal of Environmental Education* 21(4) pp.13-19.
- Wilmot, D. (2017) 'Issues-based enquiry: An enabling pedagogy for ESD in teacher education and school geography' In H. Lotz-Sisitka, O. Shumba, J. Lupele & D. Wilmot (Eds.) *Schooling for sustainable development in Africa* pp.129-138. Switzerland: Springer International Publishing.
- Yavetz, B., Goldman, D. & Pe'er, S. (2014) 'How do preservice teachers perceive "environment" and its relevance to their area of teaching' *Environmental Education Research* 20(3) pp.354-371. <http://dx.doi.org/10.1080/13504622.2013.803038>