# ALTERNATION

**Interdisciplinary Journal for the Study of the Arts and Humanities in Southern Africa Special Edition Number 21 (2018)**
**Print ISSN 1023-1757; Electronic ISSN: 2519-5476**

## *Southern African Strides in Geography Education*

**Guest Editor**
***Sadhana Manik***

* *Alter*nation is an international journal which publishes interdisciplinary contributions in the fields of the Arts and Humanities in Southern Africa.
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* *Alter*nation is indexed in The Index to South African Periodicals (ISAP) and hosted online on the UKZN platform, on OJS, and by EBSCO
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* *Alter*nation was accredited in 1996.



**COVER**

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Guest Editor
*Sadhana Manik*


2018

CSSALL
Durban

# Acknowledgement of Reviewers

We wish to acknowledge the participation of the following reviewers in the production of this issue of *Alter*nation.

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Luiza Olim de Sousa, North West University, South Africa.
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Zanele Heavy-Girl Xaba, University of KwaZulu-Natal, South Africa.

***Alter*nation Special Edition 21, 2018**
**Print ISSN 1023-1757; Electronic ISSN: 2519-5476**

Interdisciplinary Journal for the Study of the Arts and Humanities in Southern Africa

# ARTICLES



PRINT CONNECTION Tel (031) 202-7766; 202-7766

# Editorial: Southern African Strides in Geography Education[1]

**Sadhana Manik**

For the purposes of this Editorial, I want to sub-title it, 'A Focus on Geography Education Research: North and South'. My reasons for reflecting on this topic will become clear in the course of the Editorial.

Geography Education, at times termed Geographical Education, has been a growing tangent discipline of Geography internationally. There is a plethora of literature in the discipline of Geography Education (GE) from the global north but limited literature comparatively from Africa, especially in the southern African region. Literature does indeed abound from countries taking stock of GE in for example, the United States (Bednarz 2002; Bednarz 2008; Brysch 2014), United Kingdom (Lambert & Morgan 2010; Morgan 2011), France (Graves 2001), Australia (Robertson 2003), Turkey (Şahin & Karabağ 2005; Karabağ & Şahin 2007a; Öztürk 2005; Karabağ & Şahin 2007b; Taş 2007) and Korea (Seo & Kim 2012). There are also cross-country analyses of aspects of GE, such as between Turkey and the USA (Demirci 2004); Europe and the USA (Bednarz & Schee 2006) or on concerns on environmental education (Rickinson & Lundholm 2008; Marcinkowski 2009; Morgan 2015). Eight years ago, Yecit (2010) undertook an international study on research in Geography Education between the period 2000 - 2009 by accessing archives, magazines and papers submitted to national and international conferences in addition to post-graduate and PhD theses. He found that,

> the most recent studies related with Geography Education in the world are intensified on digital game based education, adaptation of latest technology to Geography lessons, development of competences in

[1] This special edition is dedicated to the late Dr. David Manyatsi, senior lecturer in Geography Education at the University of Swaziland (eSwatini).


Print ISSN 1023-1757; Electronic ISSN: 2519-5476; DOI https://doi.org/10.29086/2519-5476/2018/sp21a1

> Geography, CBS applications in secondary education and spread of CBS based social projects, environmental and citizenship education (Yecit 2010: 261).

He commented that the areas of interests were philosophical aspects of Geography Education – such as the inclusion of sustainable development, the use of technological advancements in Geography Education classrooms, textbook research, training and development of competences of teachers and the least literature was on interdisciplinary relations.

A more recent undertaking devoted to the nature of research in Geography Education in the Nordic countries can be found in the Norwegian journal of Geography's special issue (2013) on 'research on Geographical education'. The editors (Rod & Saetra 2013: 117) of this issue, argue that didactics (as a field of research) in Geography despite it being 'an evolving field of research for approximately 20 years…is not yet a particularly mature field of research'. They contend that despite a keen interest by scholars to contribute to the special issue, there was 'a relatively high number of unfinished or rejected papers' and they believe that this reflects the 'immature status of Nordic research on the didactics of Geography'.

In southern Africa, Van Eeden and Warnich (2018: xiv) note, that in the context of South Africa, 'a combined or comprehensive publication on teaching and learning History and Geography as disciplines in their own right and as combined … is long overdue'. However, it must be acknowledged that within the broad umbrella of teaching and learning of the Social Sciences (History and Geography), they do argue that there are publications, which are over a century old. Indeed, there have been some particularly significant publications from sub Saharan Africa and critical engagement in particular in the southern African region but many are now considered outdated (see for e.g. Beets & Le Grange's article on Geography Education in South Africa in 2005 and their later article in 2008 on post-apartheid curriculum reform). Of course, there are significant book and journal contributions of a philosophical nature in the ambit of teaching and learning in Geography Education in SA and Africa of late (see for example, Wilmot & Irwin 2015; Lotz-Sisitka, Shumba, Lupele & Wilmot 2016; and Van Eeden & Warnich 2018). However, there is still room for a broader expanse of the literature in Geography Education from a range of scholars publishing in GE in SA contexts and from its neighbours thus a revisiting of recent Geography Education research in the southern African re-

gion is thus timeous.

This special edition attempts to address this call partially and to expand the borders beyond SA to publications in Geography Education in the southern African region. This edition is also inspired by the work of the SANORD TEACHER EDUCATION PARTNERSHIP (STEP) thematic group of SANORD, wherein I am the co-ordinator of the global south. This special edition herein is the result of invitations to Geography Education scholars in higher education institutions across South Africa and within the SANORD network of universities, with a call to scholars in the Southern African region, specifically through the STEP thematic group in 2016/2017. The edition of journal articles thus comprises of southern Africa's most recent contributions to knowledge production emanating from three countries: South Africa, Zimbabwe and Namibia, by scholars researching in the field of Geography Education. It is also with deep regret, that this edition pays tribute and mourns the passing of Dr. David. Manyatsi in 2017 who was co-authoring a paper for this edition on the teaching of sustainable development in the Swaziland context. The review panel comprised of Geography Education, Social Sciences and education academics from the global south and north.

The edition seeks to provide a wide spread of articles from established and novice researchers publishing within the field of Geography Education in Southern African countries, that is, the recent research strides that have been made in GE in southern Africa are foregrounded. There are distinct efforts to develop scholarship and promote the mentorship of young academics in Geography Education and this is evident in several co-authored publications herein. Collectively, the edition serves to showcase the areas of research in: curriculum, teaching, learning and assessment, in addition to the epistemologies and methodologies in the expanse of research being undertaken within GE in the region (of course in the Nordic countries and Germany, they would refer to this as the didactics of Geography). Interestingly, the interest areas in Geography Education in the south do mirror many of the focus areas in Yecit's (2010) publication and the Nordic special edition (Rod & Saetra 2013). What is different is the focus on currriculum innovation in countries in the south as they grapple with decolonising the curricula and responding to climate change. Within the South African context, articles are spread across an expanse of Geography education interests from school to higher education. The school based papers focus on aspects of curriculum policy, textbooks as instructional resources at school and learner performance in the school exit

examination. The papers that are higher education centred, revolve around Geography students' preparedness for the B.Ed programme in higher education, structuring courses in mapwork and fieldwork to resolve preservice teachers' limited knowledge and skills, the introduction of innovative learning tools in courses and filling the gaps in knowledge amongst inservice teachers through open education resources. Additionally, there are contributions from Zimbabwe that deal with Geography curriculum innovation in SA and Zimbabwe, namely in the introduction of GIS into the school syllabus and the impacts of food insecurity on learners in Zimbabwe. In the Namibian context, the integration of climate change into the Geography curriculum is the emphasis. Summaries of each of the articles are catalogued below.

The edition commences with an article by Le Grange and Ontong titled: 'Towards an integrated school Geography curriculum: The role of place-based education'. Therein, the authors trace the plethora of curriculum modifications in democratic South Africa, which were a rudimentary attempt to decolonize education. In particular, they hone in on the most recent amendment called the Curriculum and Assessment Policy Statement (CAPS) and revisit the concepts of 'continuity' and 'progression' in the school Geography curriculum. They note several shortfalls in the CAPS curriculum regarding poor integration, a lack of appreciation of the value of indigenous knowledge and textbook reliance which could nurture unproductive pedagogical approaches by teachers. They conclude by suggesting what they term as 'place-based education' as both an approach and a framework to overcome the shortfalls in the Geography CAPS curriculum.

The next paper by Manik and Malahlela focuses on specifically the use of CAPS textbooks by Geography teachers in FET phase (Grades 11 and 12). They examine the use of the textbooks and associated challenges experienced by teachers in two poor provinces of South Africa: KwaZulu-Natal and the Eastern Cape, both of which are located along the eastern coast of South Africa. Their data derives from a mixed methods north-south study on Geography textbooks and pedagogy. They reveal an enormous discontent amongst the teachers who complained of textbook access challenges, which was detrimental to them achieving quality teaching and learning with resultant negative effects on learner performance. Poor textbook quality was also observed in respect of geographic content, decontextualized information, irrelevant examples and wrong information. Most interestingly was the view that some CAPS textbooks did not sufficiently address learners' needs in terms

of catering for English as a second language in the two provinces. The authors conclude by recommending a reimagining of the CAPS textbooks by all stakeholders to address the challenges experienced in the CAPS textbook use.

The next article by Ahiaku and Mncube is the result of their interest to research Grade 12 (school exit year) Geography learners' poor performance in public schools in the Ithungulu district of KwaZulu-Natal, South Africa. They undertake this investigation through the lens of teachers and they use a mixed methods approach. Using the following research tools: questionnaires and semi structured interviews, they remarkably reveal that no relationship exists between the Geography teachers' professional qualifications and learners' performance. Nevertheless, variables such as the gender of the teacher, the teaching of the subject and the teachers' marking experience were positively correlated to the learners' performance in the grade 12 Geography exit examination.

The following article keeps the discussion in South African context but shifts it away from being solely school based. Malatjie and Singh address the all important current higher education debate that abounds on the preparation of students for higher education in South Africa, in their article titled: Implications of the articulation gap between Geography learners in secondary schools and university. They used a qualitative case study approach and drew their sample from a cohort of first year Geography students who failed both semesters and lecturers who teach first year Geography. They additionally examined the Geography FET curriculum and its alignment to the first year Geography curriculum at one university. Whilst there is literature (see for e.g. Dhunpath & Vithal 2012; Manik 2015) which argues that institutions are underprepared, both Malatjie and Singh argue that Geography students are indeed underprepared for university and unable to manage the requirements for first year university Geography. Malatjie and Singh reveal an interesting caveat around learners' preparation for higher education namely that there are Geography teachers at schools who have a tendency to promote surface learning, which is rejected in favour of deep learning in higher education.

Sarita Ramsaroop's paper, which follows on, sculpts part of learners' poor performance down to teachers' weaknesses in a particular sub discipline namely that of mapwork. In her paper titled Bringing Map Learning To 'Life' By Using The Environment As A Learning Resource, she explores first year student learning in mapwork via course work and fieldwork. She reveals that students have developed pedagogic content knowledge and demonstrated

agency in their learning of mapwork and she therefore presents data that illuminate the idea that gaps in knowledge stemming from a school education can be filled through creative methodologies in university Geography education courses.

As advancements in technology begin to transform teaching and learning in higher education, Golightly and Van der Westhuizen, in their paper turn the lens to examine online learning. In particular, they explore online problem based learning amongst third year Geography Education students. Their study found that the student teachers were receptive to online learning tools as well as online collaborative spaces within which they could interact with each other. They contend that these findings have positive implications for online teaching and learning delivery models at universities.

The next paper by Dreyer hones in on needs specific inservice teacher training in Geography education. He locates a specific aspect of post-apartheid curriculum change in the Intermediate and Senior Phases where selected aspects of Physical Geography were moved out of Geography and into the theme *Earth and Beyond* in the subject, Natural Science. He then undertook a case study of a rural disadvantaged school district located in KwaZulu-Natal and noted that the Natural Science teachers did not have any Geography training and they were using a transmission pedagogic method in tandem with the textbook to teach this theme. He reports that essential geographic resources such as a map and the globe were absent in the teaching. Dreyer resultantly devises an intervention using Open Education Resources (OER) to develop these teachers professionally.

Tarisayi, in the next paper, moves the discussion on GIS to Geography Education in Zimbabwe following curriculum changes in Geography. In his paper on 'Lessons for GIS implementation in Zimbabwe from the South African experiences', he draws on the challenges experienced in the introduction of GIS in SA schools, to provide suggestions to Zimbabwean education policy stakeholders on how best to manage GIS as a new inclusion in the syllabus. He suggests integrating GIS into Geography themes in the syllabus rather than having to teach it in an isolated manner, the provision of sufficient financial resources for GIS implementation and increasing the time allocation for GIS in the syllabus.

The next paper keeps to the context of Zimbabwe. Ndiweni and Manik examine the 'Determinants of Food Insecurity Amongst Primary School Children in South Western Zimbabwe: A Case of Matobo District' through the

prism of affected parents and teachers. They report on the determinants of food insecurity in a context where inadequate data presently exists. Using a case study research design and accessing school administrators, teachers and parents of food insecure children in schools, the paper is an attempt to mine deep. The results reveal that the determinants of food insecurity amongst primary school children in Matobo district are multidimensional with numerous facets and implications for children: social, economic and environmental and collectively these tend to exacerbate the vulnerability of children. In addition to the loss of assets, the study highlights elements of dire poverty and climate change as key contributors to food insecurity for all members in a household and not only children in this rural district of Zimbabwe.

The value of understanding and learning about climate change in relation to life in southern Africa cannot be underestimated. In the final paper contribution, Tshiningayamwe examines the integration of climate change into the Namibian school Geography curriculum.

Her analysis indicates that climate change content is not fully infused into Namibia's high school Geography curriculum. She reveals that although there are features of climate change in the Geography curriculum, the teachers do lack pedagogical content knowledge, they are recipients of inadequate professional development and there exists poor quality teaching resources for climate change compromising its teaching.

There is a common thread weaving through majority of the contributions, the prevalence of poverty: a poverty of resources, finances, biophysical poverty of learners, poverty of knowledge and competences, poverty of training, a poverty of commitment. All of these serve to highlight how Geography Education can be vulnerable to subverting the progress of a post-colonial education that countries in the southern African region have been trying to infuse to garner positive changes in education. But… there is hope presented in all the papers, the authors provide recommendations which can serve to build resilience and reignite the post-colonial task at hand. Nevertheless, I do persist in my argument that there is a need to continue to examine and take stock and trace the status of Geography Education in countries in the southern African region due to the nature of post-colonial curriculum transformations and innovations that have been unfolding. It is evident that education is being fashioned to be responsive to environmental and technology concerns in addition to efforts to decolonize Geography curricula.

**Acknowledgement:** I am grateful to Prof. Erlend Eidsvik, of Geography Education at Western Norway University of Applied Sciences and SANORD representative, for his critical commentary on this Editorial.

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# Towards an Integrated School Geography Curriculum: The Role of Place-based Education

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**Krystle Ontong**

## Abstract

In this article, we review literature on curriculum changes to school Geography in post-apartheid South Africa. We note the gains and losses with each iteration of the national curriculum for school Geography over the past two decades or so. We argue that although the latest version, the CAPS has been strengthened in terms of continuity and progression it still has shortcomings: integration in the curriculum is weak, Indigenous Knowledge is not valued and its reliance on textbooks is likely to foster behaviourist pedagogical practices. We propose place-based education as a conceptual framework and approach to address current weaknesses in school Geography in South Africa so as to imagine the practice differently.

**Keywords:** CAPS, curriculum reform, curriculum integration, Indigenous knowledge, place-based education, school Geography

## Introduction

There is a growing body of literature that has been produced on school Geography in post-apartheid South Africa. Our interest in this article is on the broader curriculum debates captured in this literature and in particular on those relating to the different iterations of the national curriculum, since the introduction of Curriculum 2005 in 1997, up to and including the Curriculum Assessment and Policy Statement (CAPS) published in 2011. We shall show


Print ISSN 1023-1757; Electronic ISSN: 2519-5476; DOI https://doi.org/10.29086/2519-5476/2018/sp21a2

that although the integrity of Geography has been strengthened over time, and so too continuity and progression across grades in the most recent version, the CAPS, there might still be several shortcomings such as that:

- the content of the curriculum is compartmentalised, thwarting efforts to integrate learning;
- the curriculum is textbook-based limiting possibilities for promoting constructivist learning;
- the inclusion of indigenous knowledge systems has been weakened (compared to some earlier iterations); and
- the term place has been constructed in mainly technical terms, as a natural construct rather than a social construct.

We explore the potential that place-based education as an approach could have in addressing shortcomings in the CAPS for Geography, were the approach to be understood and implemented by Geography curriculum makers, teacher educators and teachers.

A critical assessment of the CAPS for Geography has to, however, be contextualised within curriculum reform that has occurred in post-apartheid South Africa. Moreover, curriculum reform that occurs over time inevitably leads to gains and losses as curriculum changes occur with each new iteration of a national curriculum. Therefore, by way of background we shall review key changes that occurred to the national curriculum for school Geography over the past two decades or so, noting the key losses and gains with each version of the curriculum.

## National Curriculum Change and School Geography

The first post-apartheid national curriculum framework was called Curriculum 2005, which indicated the final year that the new curriculum was intended to be implemented in all school grades (Le Grange 2000). In some senses the curriculum marked a radical departure from the apartheid curriculum and its post-apartheid modification, NATED 550[1]. Other than its most contested

[1] NATED 550 was an interim syllabus (1995 - 1997) that was a modification of the apartheid syllabus. The modifications involved removing offensive content from syllabi such as racial content.

element outcomes-based education (OBE) (Le Grange 2010), Curriculum 2005 proposed a shift from a subject-centred approach to a more holistic learner-centred approach organised around integrated learning areas. This shift proposed the relinquishing of a primary reliance of textbooks as curriculum resource to the use of a range of curriculum resource materials of which textbooks could be one. Geography, had its 'home' in an integrated learning area called, Human and Social Sciences. This new arrangement elicited differing views from geography educators in South Africa at the time. Nel and Binns (1999) argued that this new arrangement placed school Geography in a precarious position in the sense that geographers were struggling to define Geography's identity within the newly established learning area in the General Education and Training (GET) band. They further expressed a concern about uncertainty as to whether Geography would be a separate subject in the Further Education and Training (FET) band. Curriculum 2005 was, however, aborted before it was implemented in the FET band, thus removing the latter concern. Ballantyne (1999) raised a concern about the implementation of the integrated learning area, arguing that teachers with a History background would foreground History in the classroom and those with a background in Geography would foreground Geography, potentially resulting in the dilution of either subject in specific classrooms. In relation to this concern, Binns (1999) points out that where integrated learning areas have been introduced in countries such as Australia and the United States of America (USA), Geography educators struggled to regain the subject's identity. In contrast, Van Harmelen (1999) took a more positive stance towards the changes that Curriculum 2005 introduced. She argued that Curriculum 2005 provided radical opportunities to rethink Geography education in South Africa by breaking away from textbook-based behaviourist approaches to school Geography. Van Harmelen averred that Curriculum 2005 opened up possibilities for social constructivist approaches to Geography education. About the FET Geography curriculum (NATED 550) that was still in place when Curriculum 2005 was implemented in the GET, Nel and Binns (1999) argued that this syllabus was dominated by thinking of western academic Geography, with a strong Eurocentric focus, reflecting the traditional values of 'White' South Africa.

In 1999 a committee was appointed by the Minister of Education to review Curriculum 2005, giving geographers and Geography teachers opportunities to forward submissions so as to strengthen the position of school

Geography (Le Grange & Beets 2005). The upshot of this was the buttressing of the distinctive character of Geography in the Revised National Curriculum Statement (RNCS) for the GET band and the reinforcing of Geography as one of 29 distinctive subjects of the National Curriculum Statement (NCS) in the FET band. However, although the distinctive identity of Geography was gained in the newly named GET Social Sciences learning area by having learning outcomes and knowledge foci separate from that of History, Physical Geography remained located in the Natural Sciences learning area and defined by the scope statement of the theme The *Planet Earth and Beyond* (Le Grange & Beets 2005). Concerning the FET, Le Grange and Beets (2005) pointed out that even though Geography was a distinct subject, it was located in the human and social studies learning field[2]. The implication of Geography's location in only one learning field meant that even though the rules of combination allowed for it to be offered as both a core and elective subject, the probability of it being offered as a core subject in schools was reduced (for a more detailed discussion see Le Grange and Beets 2005). About Nel and Binns's criticism that the NATED 550 Geography syllabus was Eurocentric, Le Grange and Beets (2005) point out that Indigenous Knowledge was included as one of the principles on which the NCS was based, registering the possibility for Geography teachers to include Indigenous Knowledge in the learning programmes they designed, and by so doing potentially decentering western approaches to school Geography. In short, the gains that the transition from Curriculum 2005 to the NCS brought about were the strengthening of Geography's identity in both the GET and FET and in the case of the FET the inclusion of Indigenous Knowledge. However, the NCS for Geography in the GET and FET still had weaknesses; a discussion to which we now turn.

In two articles Beets and Le Grange (2005, 2008) demonstrate that even though continuity and progression did improve in some respects in the transition from Curriculum 2005 to the RNCS and the NCS, there were still instances where these dimensions of curriculum design were weaker when compared to Curriculum 2005. Moreover, in areas where continuity and progression had been improved the documents provided insufficient information for teachers to design learning programmes that would ensure the incorporation of continuity and progression (Beets & Le Grange 2005).

[2] The NCS of the FET band had six learning fields from which the 29 subjects were derived.

Continuity relates to the persistence of certain significant features of geographical education (in this instance) as a learner moves across grades in the schooling system. These significant features include: *content*, *types of learning activity*, *common assumptions about the nature of the subject*, *geographical skills* and *use of certain resources* (Beets & Le Grange 2008). Progression (also called sequencing) is concerned with the careful and deliberate sequencing of learning so that learners can build on their prior learning and prepare for their future learning. It is this dimension that depicts the deepening of learning as learners move across grades. Beets and Le Grange (2008) point out that this is not a simple exercise and requires careful planning and a valid understanding of learners' actual and potential levels of performance. This brings us to the most recent iteration of the NCS, the CAPS. The Curriculum Assessment Policy Statement (CAPS) was produced in 2011 and phased into schools in 2012. The CAPS saw the removal of outcomes-based education (OBE), following sustained critiques of this approach to education (see Jansen 1998; Jansen & Christie 1999; Le Grange 2000; 2008; 2010; Morrow 2007; Allais 2007; Shalem & Pendlebury 2010). Le Grange (2014), however, argues that outcomes were simply replaced by aims and that the CAPS and all other versions of post-apartheid national curriculum frameworks for schools are neo-Tylerian[3].

The CAPS for Geography in the GET and FET were clearly developed to strengthen continuity and progression (see DBE 2011). Evidence of this, in the case of the FET band, is found in a comprehensive demonstration of continuity and progression (in particular) in a recently published chapter by Golightly and Van der Westhuizen (2017). But, the CAPS also introduced some other elements. It is much more prescriptive than earlier iterations of the national curriculum for schools in the sense that it dictates when, how and for how long teachers must teach different topics (Le Grange 2014). The introduction of the CAPS also saw a return to a textbook-based curriculum that was last evidenced in the NATED 550 interim syllabi.

Continuity and progression are issues of verticality. In other words, they are respectively concerned with the persistence of features and depth in learning as learners progress vertically through the schooling system (from grade R to 12). However, there is another curriculum development/design

[3] Derived from the four principles of curriculum development produced by Tyler (1949).

dimension that is an issue of horizontality, called integration[4]. Integration as a curriculum design principle is a twentieth century phenomenon that might have some of its origins in progressivist education exemplified in the work of John Dewey who argued for the integration of school and society, and the integration of the curriculum with the life world of the child (Dewey 1902; 1915). Nsubuga (2009) argues that in South Africa, we first saw evidence of integration occurring with the People's Education Movement, where attempts where made to integrate theory and practice, and head and manual work. In relation to curriculum design Le Grange and Reddy (2017) state that integration relates to how different curriculum components (including content) are associated with/to each other horizontally so as to give learners a unified rather than atomised sense of knowledge. The extent to which the CAPS for Geography promotes integration is a relatively unexplored area in the literature. For the purposes of this article, we shall focus on the integration of different components of the CAPS curriculum for FET Geography to provide learners with a sense of wholeness; and integration of schooling with the life world of the learner (the places learners inhabit and that inhabits them).

Moreover, the return to a textbook-based curriculum is likely to encourage behaviourist-teaching practices and thwart social constructivist pedagogies that Van Harmelen (1999) celebrated with the introduction of Curriculum 2005. Although Indigenous Knowledge continues to feature in the CAPS for Geography it is only mentioned twice in the FET document (DBE 2011), which means that it could easily be ignored by teachers if not assessed in the national senior certificate examinations, for example. Nel and Binns's (1999) concern of a Eurocentric Geography curriculum for South Africa might therefore not yet be allayed.

In summary, curriculum reform in relation to school Geography has had both gains and losses. The CAPS for both the GET and FET show that continuity and progression has been strengthened and that the identity of Geography in both these curriculum statements has been solidified. Though, not without challenges (lack of resources and training of teachers in many schools), the inclusion of Geographical Information Systems (GIS) in the FET curriculum is viewed positively because it has proved to be a successful sphere

[4] Not all curriculum scholars hold that curriculum integration is a matter of horizontality. For example, Muller (2000) views progression as a form of vertical integration.

of study and application (Manik 2016). However, there remains several shortcomings in the CAPS for Geography: the extent to which integration has been achieved remains largely unexplored; a return to a textbook-based curriculum could encourage behaviourist pedagogical approaches; and the weakening of the inclusion of Indigenous Knowledge systems when compared to earlier incarnations of the national curriculum, could reinforce a Eurocentric curriculum. Against this backdrop, in this article we shall investigate the extent to which integration is evident in the CAPS for FET Geography by focusing on the construct place, which is according to the CAPS document one of 'Geography's four Big Ideas' (DBE 2011: 7). We shall also explore the extent to which an integrated idea of place is evident in questions that appear in the national senior certificate (NCS) examination question papers. The latter will be done because we hold the view that what is assessed (particularly in high-stakes examinations) is likely to determine teaching practices in classrooms. We shall also explore possibilities that place-based education might offer to strengthen integration in the FET Geography curriculum, strengthen the inclusion of Indigenous Knowledge systems in the curriculum and mitigate against behaviourist pedagogical practices. This brings us to a discussion on place and place-based education.

## Place and Place-based Education

According to Cresswell (2004; 2008) the concept of place derived from Geography in the 1950s and gained prominence in the discipline during the late 1970s and 1980s. He asserts that, even though 'place' could be deemed a meaningful theoretical terrain, it remains a difficult term to conceptualise because of its multiple meanings in various contexts. However, a multiple or expanded notion of place could be celebrated. For example, Gruenewald (2003: 619) argues for a multidimensional view of place comprising the perceptual, ideological, sociological, ecological and political dimensions (for a more detailed discussion on this see Ontong & Le Grange 2015, 2016). Albeit that various geographers claim that place represents a sort of bounded space, Malpas (2016) argues, that its bounds do not take the form of dividing lines in space. According to him place is neither spatial nor temporal but encompasses both while refusing identification with either. He writes: 'to suppose otherwise would be to suppose that place somehow came after space, as a modification

of it, whereas the reality is that it is place that comes first, and it is space that is the dependent phenomenon' (Malpas 2016: 384). Furthermore, Cresswell (2004) provides three fundamental aspects of place to distinguish between the term's technical meaning and daily usage, namely, place as *area*, *locality* and *sense of place*. In this article, we embrace an expanded notion of place instead of its representation in technical terms, i.e. as coordinates on a map. A technical view of place holds that it is synonymous with area and locality, and subordinate to space (Ontong & Le Grange 2016).

Contending for an expanded and nuanced understanding of place is the interest of a recent development called place-based education. However, this discussion is not new to the field of Geography. Human geographers have long ago challenged the privileging of place in terms of scale, stressing that place/scale too are not given, but contingent, contested social constructs that are continually being made and remade. For example, Buttimer and Seamon (1980), Ley (1983), Relph (1976) and Tuan (1977) have reminded geographers that people do not live in a framework of geometric relationships, but in a world of meaning. Tuan (1977) avowed that place has no particular scale associated with it, but is created and maintained through the 'fields of care' which results from people's emotional attachment to it. Tuan (1977) specifically stressed the sensual, aesthetic and emotional dimensions of place. While, most (human) geographers have reached consensus that neither place nor scale is a fixed or given category, but socially constructed, fluid and contingent (Marston 2000), this understanding has not trickled down to the school curriculum. As Ontong and Le Grange (2016: 136) write: 'Even though geography as a discipline has progressed over the years, at school level the subject geography predominantly continues to focus on developing map skills among students … while underemphasizing the other distinctions of place'. Gruenewald (2003) forcefully reminds us that if we fail to consider places as products of human decisions, we accept their existence as inevitable, like the falling of rain or the rise of the sun. Against the backdrop of our discussion of an expanded view of place, we turn to a discussion on place-based education.

Although the origin of placed-based education (PBE) could be traced back to the 17$^{th}$ century, the idea has gained prominence over the past two decades (Ontong & Le Grange 2016). Place-based education is an educational approach that embraces a multi-disciplinary approach to place (Gruenewald & Smith 2008) and (re)connects humans with land (Knapp 2005). Woodhouse and Knapp (2000) aver that PBE embodies specific attributes of place, namely,

that it is inherently multidisciplinary, inherently experiential, reflects an educational philosophy that exceeds learning to learn, and connects place with the self and the community. According to Gruenewald and Smith (2008), the purpose of PBE is both to increase student engagement and achievement and to promote democratic participation in local community processes. Gruenewald (2003) states that place-based pedagogies are needed so that education of citizens might have some direct influence on the well-being of the social and ecological places that people inhabit.

The distinguishing feature of PBE, however, is not its specific methods (it draws from various pedagogic traditions), but rather its animating social purpose (Israel 2012). Through outdoor activities that engage learners with their community and natural environment, learners in place-based educational programmes learn about their place and learn to care for it: gaining knowledge and skills are inextricably connected with feeling and acting in new ways. With this connection between cognitive, affective, and ethical impacts upon learners, PBE provides a framework for making connections between content and pedagogy for socially engaged Geography teachers, offering a specifically geographic vision of ethically and politically engaged pedagogy (Greenwood 2013; Gruenewald 2003; Israel 2012; McInerney, Smyth & Down 2011). Such learning cannot be textbook-based and occurs socially as learners engage with one another, communities and the natural environment. Through such engagement, new meanings are constructed in/about the places that leaners inhabit and that inhabit them. Moreover, PBE fosters an understanding of the oneness of people and places, a oneness between social and the natural (ecological) so that places are not studied as objects from a distant human gaze but that human knowledge (including learners' learning) are inextricably bound up with/in places. In short, place-based education does not only embrace a multidisciplinary perspective on place but also an integrated understanding of the concept.

Due to its emphasis on 'localness', PBE is inherently grounded in Indigenous Knowledge. Each place (incorporating people) has stories to tell or a dominant story to tell. As Tuck and Yang (2012) assert that Indigenous people have deep-rooted creation stories to share, not the ones told by colonisers. Yet, Greenwood (2013: 98) cautions that we need to devote attention not only to the dominant narratives, but also to 'all the stories at risk of being silenced or erased, including the voice of the land itself'. In the following section, we shall briefly describe the methodological framing of the empirical component of this article.

## Methodological Approaches

We shall use two research methods: a quantitative survey of documents and a qualitative content analysis of documents. The documents that will be surveyed and analysed quantitatively will be the CAPS for FET Geography (DBE 2011) and selected national senior certificate examination question papers for Geography. The survey of the CAPS will quantify the allocation of time per annum to the concept of place in the document. The qualitative content analysis will identify different units of meaning on place in the CAPS document to establish whether any units of meaning convey an integrated view of the concept. National senior certificate Geography question papers will be surveyed to quantify the percentage of the questions in the papers, which focus on the concept place. The qualitative content analysis of the examination question papers will identify whether the questions on place view place in atomistic terms or in an integrated manner.

The quantitative survey analysis comprises the following steps:

- An electronic search of the CAPS for FET Geography document to identify all references made to the word 'place';
- Highlighting references to the word 'place' in the following sections of the CAPS document: *Overview of the Content in the FET band*; *Overview of the Geographical Skills and Techniques in Grades 10, 11, 12*; and *Geographical Knowledge*;
- Calculating the teaching/learning time allocated to sections of the CAPS that make direct reference to the concept 'place';
- Determining the sum total of all questions in each of the NCS Paper 1 examinations for the years 2013 - 2017;
- Calculating the percentage of questions that are related to the concept 'place' for each of the NCS Paper 1 examinations for the mentioned years.

The qualitative content analysis comprises the following steps:

- Identifying units of meaning related to the concept 'place' in the CAPS document and the selected NCS Paper 1 examination papers;
- Interpreting units of meaning in relation to different understandings/ dimensions of place.

The November National Senior Certificate (NSC) examination papers (2013 - 2017) for grade 12 will be selected for this study. These papers will be selected to not only get a general sense of the geographical knowledge that learners need to know at the end of their schooling career, but also to view how integration occurs and how place is represented.

## Analysis of Curriculum and FET Examination Papers

### *CAPS Document*

In this section, we describe the extent to which the CAPS for Geography in the FET band makes reference to the concept place. Firstly, one of the nine aims of the CAPS Geography for the FET band makes direct reference to the concept place and reads as follows: 'developing knowledge about where places are, and the nature of a range of different places at different scales' (DBE 2011:9). Secondly, and most importantly the document states that any topic in Geography can be explored by applying a conceptual framework that embraces Geography's four big ideas: *place*; *spatial processes*, *spatial processes*; *spatial distribution patterns*; and *human and environmental interaction* (DBE, 2011: 9). The significance of the concept place is clearly emphasised in the CAPS for Geography in the FET band.

However, in the sections *Overview of Geography Content in the FET band, Overview of Geography skills and Techniques in Grades 10, 11 and 12* and *Geography knowledge* (where time allocations are included) scant reference is made to the concept place. In the section *Overview of Geography Content in the FET band* there is not one direct reference made to the concept place under the listed topics. In the section *Overview of Geography skills and Techniques in Grades 10, 11 and 12* there is only one direct reference made to place in grade 11, under the topic *Using atlases (revision)*, 'Locating places on different maps: degrees and minutes' (DBE 2011: 16). In the part of the document *Geographical Knowledge*, where all the main topics and sub-topics for grades 10-12 are listed, with allocated times that should be spent, direct reference to place is only made five times. In grade 10, direct reference to place is made once under the heading, *Heating of the Atmosphere*. This topic is allocated **eight hours**, with five sub-topics of which one sub-topic refers to place, 'factors that affect temperature of different places around the world: latitude, altitude, ocean currents and distance from oceans' (DBE 2011: 21). If equal time were to be spent in classrooms on each of the five sub-topics then only **96**

**minutes** per annum would be devoted to the sub-topic that refers to place.

With reference to Grade 11 there are two direct references made to place, under the topic *Using Atlases (revision)*, which is allocated **two hours**. This topic has three sub-topics of which one makes direct reference to the concept place, 'locating places on different maps, using degrees and minutes' (DBE 2011: 29). If each of the three topics were to be allocated equal time in classrooms, then the one that refers to place will presumably be allocated **40 minutes** per annum in classrooms. The same topic and sub-topics are included later in the document where **one hour** is allocated to the topic (DBE 2011:35). This means that an additional **20 minutes** could be allocated to the sub-topic on place in Grade 11. Under *Geographical Knowledge* for Grade 12 there are two direct references made to the concept place. Under the topic *Urban Settlements*, to which **four hours** is allocated, there are three sub-topics and one refers to place, 'classification of urban settlements according to function, such as central places, trade and transport, break of bulk points, specialized cities, junction towns and gateway towns or gap towns' (DBE 2011: 45). If equal time were devoted to each of the sub-topics under *Urban Settlements*, then **80 minutes** per annum of teaching/learning will be allocated to the sub-topic, which refers to place. The last reference to the concept place in the part of the document that covers *Geographical Knowledge* is under the topic, *Urban Hierarchies*. This topic has three sub-topics and the one that refers to place reads as follows: 'the concepts of urban hierarchy, central place, threshold population, sphere of influence and range of goods'. The topic *Urban Hierarchies* is allocated **two hours** per annum, meaning that the sub-topic that refers to place will presumably be allocated **40 minutes** per annum.

A few observations are worth noting. Firstly, direct reference to the concept place in the CAPS document is scant. Secondly, place appears to be treated in fragmented ways and there is no evidence of integration of place across topics or sections. Thirdly, in the document place is constructed in technical terms as coordinates on a map and as something that the human can study at a distance, as if detached from places. Fourthly, the rigid time allocation to topics and the compartmentalised structure of the topics in the document threatens to thwart efforts to integrate topics and their sub-topics. All of this is compounded by a curriculum that relies heavily on the use of prescribed textbooks.

However, we also analysed examination question papers to ascertain the coverage that the concept place enjoys and to ascertain to what extent the

concept place is integrated in questions asked. We focus our analysis on the national senior certificate examinations because these are the only ones that are standardised in South Africa. Our assumption is that the nature of the questions in the NSC examinations will influence how teachers teach and what is taught. Moreover, that the type of questions asked in the NCS examinations will not only affect teaching in grade 12, but that there will be a trickle-down effect to grades 10 and 11.

## *Examination Papers*

The grade 12 National Senior Certificate (NCS) examination for Geography consists of two papers (Paper 1 and Paper 2) with each one accompanied by an annexure containing all graphs, maps and visual representations. Paper 1 deals with Physical and Human Geography and totals 225 marks. The second paper comprises map work and GIS components, totaling 75 marks. Paper 1 is divided into two sections: section A comprises climate, weather and geomorphology; and section B comprises rural and urban settlements and South African Economic Geography. Learners are expected to answer at least one question in both sections and have a choice on the other two questions that they have to answer. Table 1 below represents the structure of the NCS examination for Geography in the FET band.

**Table 1: Structure of the NCS examination for Geography in the FET band**

<table>
<tr><td colspan="5">Geography<br>National Senior Certificate<br>Grade 12 Examination Papers<br>(300 Marks)</td></tr>
<tr><td colspan="2">Paper 1</td><td colspan="3">Paper 2</td></tr>
<tr><td>Section A</td><td>Section B</td><td colspan="3"></td></tr>
<tr><td>Weather, Climate and Geomorphology</td><td>Rural and urban settlements and South African Economic Geography</td><td>Map calculations and techniques</td><td>Application and interpretation</td><td>GIS</td></tr>
<tr><td colspan="2">225 Marks</td><td colspan="3">75 Marks</td></tr>
</table>

From the division into the two papers it is evident that Paper 2, which comprises 25% of the examination is solely based on the technical dimension of place (calculations, map interpretation, applications, etc.). Paper 2 is sub-divided into map calculations and techniques, application and interpretation and GIS. Map calculations entail calculations of magnetic bearing, area and gradient among others. For example, a typical question in the 2016 November paper reads as follows, 'Calculate the average gradient between spot height 1306 (K) and trigonometrical station 101 (L). Show all calculations. Marks will be awarded for calculations' (DBE 2016: 7). A similar example appears in the 2017 Paper 2: 'Calculate the vertical interval (VI) between M and spot height 1395 in metres. Show all calculations. Marks will be awarded for calculations' (DBE 2017b:7). Our analysis shows that this was the standard format and type of questions found in Paper 2 for the years 2014 and 2015 as well. The emphasis is largely placed on calculations in Paper 2. Further evidence of this is the fact that learners are awarded with marks should they present all their calculations. This highlights how the technical dimension of place is focused on at the cost of other dimensions of place such as the sensual, aesthetic and emotional. In cases where learners are not expected to do calculations, the reasoning that they need to apply in order to answer the questions, remains technical in nature. For example, this is apparent in the following question asked in Paper 1 where students are expected to: 'describe one climatological disadvantage for people living in West End' [and to] 'give two points of evidence on the topographical map to substantiate the statement' (DBE 2017b: 12). Now, we turn to an analysis of Paper 1 to see to what extent the concept place is covered in the questions posed in the paper and to see whether place is presented in an integrated manner in the questions. Table 2 below represents the percentage of questions[5] related to place asked in the NCS Paper 1 examination for the years 2013-2017 (DBE 2013; 2014; 2015; 2016; 2017a; 2017b).

**Table 2: Percentage of questions related in 'place' in the NCS examination Paper 1**

| Year | 2013 | 2014 | 2015 | 2016 | 2017 |
|---|---|---|---|---|---|
| Number of questions | 121 | 153 | 139 | 147 | 146 |

[5] Note that the questions here include all sub-questions which fall under the main questions learners have to choose from.

| | | | | | |
|---|---|---|---|---|---|
| Number of questions related to 'place' | 46 | 57 | 72 | 68 | 81 |
| % of questions related to 'place' | 38.02 | 37.25 | 51.79 | 46.26 | 55.48 |

The relatively high percentage of questions related to place in the Paper 1 examinations we analysed for the years 2013 to 2017 is encouraging, given the fact that direct reference to the concept place in the CAPS for FET Geography is scant. This gives some credence to the statement in the CAPS for FET Geography that place is one of the big ideas of Geography. It also indicates that assessments and by implication curriculum materials as well as teaching and learning can be interpreted more broadly/liberally than what the curriculum document appears to convey – that assessors, teachers and textbook writers have agency. However, given the structure of the examination papers and the way in which geographical knowledge in the CAPS document is divided into different sections/components, questions on place remain mostly compartmentalised, and many questions on place represent the concept in technical terms and as having fixity. For example, in Paper 1, questions related to place in the grade 12 November 2014 NCS paper required of learners to answer the following: 'Define the term rural-urban migration. Give TWO push factors that result in rural-urban migration. Propose ONE way of preventing rural towns from becoming "ghost towns". … There is a view that quality housing and employment opportunities are pull factors to urban areas. In a paragraph of approximately EIGHT lines, critically evaluate the extent to which this is true' (DBE 2014: 12). Although these questions relate to place, they are chiefly based on memory recall and do not reflect the multidimensionality of the concept. Nowhere are learners asked to explain the human's interaction/relationship to and the effects on the natural environment in these questions. People's attachment to places are also not emphasised, for example, how people feel when they have to leave home due to pull or push factors related to migration.

The seemingly disparate questions/themes discussed in the previous paragraph could, however, be integrated. The kind of calculations mentioned and the type of reasoning required in Paper 2 are important, but could be integrated with most of the themes in Paper 1. For example, some of the skills like calculating gradient, drawing cross sections, the notion of buffering in GIS

and so forth could be integrated with Paper 1 under rural and urban settlements where more preference is given to the 'emplaced' human being. This would not only provide learners with a multidimensional view on the concept of place, but would also foster a more holistic and nuanced understanding of the concept. Based on the current organization of content in the NSC grade 12 examination papers, it can be said that place is represented as something divorced from the human being and which can be studied objectively from a distance. Though traces of the human's embeddedness in place can be seen in Paper 1, for example, '… evaluate how the inhabitants and their activities in informal settlements negatively affect the environment' (DBE 2016: 9), the rest of paper mainly requires technical reasoning and answers. For example, under climate, weather and geomorphology, students are asked to give answers to questions such as, 'state where the highest wind speed is recorded in the graph … in which area does the tropical cyclone experience the lowest pressure?' (DBE 2016: 3).

There, are, however, questions in all of the NCS papers where some degree of integration can be observed in relation to the concept place. For example, the following questions asked in the 2013 NSC Paper 1 examination: 'Explain why people in KwaZulu-Natal would not have been prepared for the chaos created by tropical cyclone Irina. Give TWO reasons'; and 'Write a paragraph (approximately 12 lines) explaining the impact that the flooding caused by Irina would have on the economy and environment of KwaZulu-Natal' (DBE 2013: 4). Here we see how the study of weather systems is integrated with the interests of people, the economy and the natural environment. Another example where an integrated notion of place might be evident is in the following questions asked in the NCS Paper 1 of 2014: 'What initiated the Marikana strike? …'; 'State TWO safety hazards that the miners are exposed to …'; 'Besides industrial activities, discuss why the instability at Lonmin's Marikana mine will impact negatively on the GDP ...'; How can the owners (Lonmin) of the Marikana mine improve working conditions at the mine? …' (DBE 2014: 12). Here we see how mineral deposits in a certain geographical area of South Africa intersect with the economic activity of mining and with people's safety and livelihoods. It integrates aspects of geomorphology with Economic Geography and Human Geography (in particular rural and urban settlements). The questions also embrace a more expanded notion of place than viewing place in purely technical terms. Notwithstanding this, much of work related to the content of the questions

would have been learned through use of textbooks, given that the CAPS is a textbook-based curriculum. The upshot of this is that learners view places as distant from themselves, their beliefs, interests and values. In other words, there is little room for leaners to engage with the places they know, the places they are attached to and which give meaning to their lives – the places they inhabit and that inhabit them. Innovative teachers, will of course find opportunities for learners to engage with/in local places and introduce pedagogies that will enable learners to understand place as multidimensional. Nevertheless, when a curriculum is as prescriptive that the CAPS is, then such opportunities might be rare.

None of the questions in the five NCS examination papers surveyed referred to Indigenous Knowledge, confirming our earlier point that even though Indigenous Knowledge is stated as a key principle of the CAPS, the principle may not be observed in all school subjects. Moreover, a prescriptive and textbook-based curriculum is likely to be concerned with transmission modes of teaching rather than social constructivist approaches. We suggest that placed-based education is an approach/framework to/for education that could address some of the shortcomings of the current school curriculum for FET Geography.

## Discussion

Based on the analyses of both the CAPS and NCS examination papers, one may conclude that place is (re)presented in a fragmented rather than integrated manner. Compartmentalisation into the four branches of school geography manifests in the examination papers and by association possibly in the pedagogical practices of teachers as well. This situation is an impediment to geographical understanding; given Hurry's (2010) contention that holistic teaching and learning are key principles for fostering geographical understanding. Place-based education is an overarching approach that could integrate the different dimensions of place captured in the CAPS for FET Geography and the NCS examinations for the subject. This would require rethinking the pigeonholing of the different dimensions of place into particular divisions/sections of Geography and would give fuller credence to the view that place is one of the 'Big ideas' of Geography. The current way in which both the CAPS and the NCS is structured along specialist areas of the discipline Geography necessitates the raising of a critical question, what is school

Geography for? Should school Geography mirror the traditional specialist areas of the academic discipline Geography[6] or focus on developing Geographical knowledge and skills needed for learners to function as critical citizens in society? Our preference is for the latter view of schooling through place-based education aimed at developing a critical consciousness in/on/with place or places. A place-based approach to school Geography would mean that artificial divisions between a Paper 1 and Paper 2, as is currently the case with formal examinations, should be done away with. It is instructive to note that Geography Paper 2 (practical work in Geography) was introduced as part of the matric examination in South Africa as far back as the 1960s at a time when positivism had a strong influence on the discipline, and there was a strong alignment between school Geography and the study of academic Geography at university (Wesso & Parnell 1992; Manik 2016). These reasons might not hold in a contemporary world that is faced with complex problems and that requires integrated and complex responses.

Place-based education embraces a multidimensional view of place, holds that place is a concept that is socially constructed, that subjectivities are bound up in places, and that both subjectivities and places are fluid, complex and performative. Humans' connections with places are 'intra-actions' (Barad 2007: 33) – humans' action in/on/with places are bound up in the places. Place-based education therefore implies new ways of knowing that cannot be textbook-based and abstracted from the places studied. Law (2004) is helpful in outlining alternative ways of knowing. Law (2004: 3) identifies four alternative ways of knowing: knowing as embodiment, knowing as emotionality and apprehension, knowing through deliberate imprecision, and knowing as situated enquiry. Knowing as embodiment is to know through the hungers, tastes, discomforts, or pains of our bodies. Knowing as emotionality is about opening ourselves to worlds of sensibilities, passions, intuitions, fears and betrayals. Knowing through deliberate imprecision is about rethinking our ideas about clarity and rigour, and about finding ways of knowing the indistinct and slippery without trying to hold them tightly. Moreover, knowing as situated enquiry is about rethinking how far knowledge is able to travel and whether it still makes sense in other locations. The ways of knowing that Law (2004)

[6] We refer here to traditional specialist areas of Geography typically taught in university courses, and not leading edge work done in the discipline of Geography on place, to which our ideas on place expressed in this article align.

open up are at the heart of place-based education, which emphasises people's oneness with places, their attachment to places, and that their knowledges are located in places. Place-based pedagogies cannot therefore be circumscribed to knowledge transmitted through textbooks, but should be about learning in interaction/intra-action with others (both human and non-human). The situatedness of all knowledge suggests that all knowledges are Indigenous, even those knowledge systems such as western science, which has the appearance of universal truth and whose cultural fingerprints might not be as conspicuous as those commonly referred to as 'indigenous knowledge' (for a detailed argument, see Gough 2003). Place-based education therefore values Indigenous Knowledge, recognising that no knowledge exists separate from places.

But, what might all of this mean for curriculum advisors, teacher educators and teachers in the field of Geography? We suggest that all involved in the Geography community might begin by familiarizing themselves with the multidimensionality of the notions of place and place-based education. Moreover, that these role players view place-based education as a potentially useful approach for overcoming the disintegration between the four branches of school geography, and concurrently promoting social constructivism. This could be achieved through embracing Marston, Jones and Woodward's (2005) proposal of a 'flat ontology' that draws on actor-network theory (ANT) and focuses on specific social sites of interaction (Schatzki 2002). Flat ontology is in contrast with the vertical hierarchy of place/scales and supports sites (contextual milieus composed of human and non-human practices and order) as the basic spatial entities upon which socio-spatial theorizing should be built. A flat ontology assumes that 'place' is always emergent and that sites are continually transformed through unfolding network connections with more wide-ranging spaces. Marston, *et al.* (2005) argue, that only through flat ontology will all scalar conceptual baggage be discarded. The proposals made in this article are radical and are in conflict with a prescriptive textbook-based curriculum, but a necessary challenge to all those with a stake in school Geography. A starting point could be to identify opportunities that the current curriculum provides for enacting some of these proposals. One such opportunity is in the CAPS document itself, the view that place is one of four Big ideas that any conceptual framework in Geography can be based on (DBE 2011: 8).

Closer to the classroom, a possibility worth exploring is for both teachers and teacher educators as a means to overcome the 'objectification' of

place in the CAPS and examination papers could be through quick response (QR)[7] codes. The generation and integration of QR codes when teaching any theme (especially place) in Geography will not only enhance ICT in teaching and learning processes but will also make information on maps, graphs and other themes a reality for learners. In this way, synoptic and topographical maps and other geographical phenomena like hurricanes, plate tectonics and so on come 'alive' in real time and makes content relevant and easy to understand. QR codes are especially useful in cases where teachers experience challenges with out-of-the-classroom learning experiences/activities.

## Conclusion

In this article, we reviewed literature on curriculum reforms in school Geography that have occurred in post-apartheid South Africa. We noted the gains and losses of each curriculum change. We argued that although the most recent version of the school Geography curriculum (the CAPS) has addressed shortcomings of previous post-apartheid curricula, it still has shortcomings: integration is relatively weak; the inclusion of Indigenous Knowledge has been considerably weakened; and a return to a textbook-based curriculum may foster undesirable behaviourist pedagogical practices.

We propose place-based education as an approach that can address these weaknesses in the current school curriculum. This approach holds the promise of integrating different components of Geography around one of Geography's big ideas, the concept place. Place-based education gives credence to what has become clichéd, 'all knowledge is socially constructed and situated' and therefore values Indigenous Knowledge. Moreover, because knowledge is the product of human intra-action with places, it cannot preexist such intra-actions with places and therefore cannot be textbook-based. Place-based education therefore provides a way of integrating schooling with the places learners inhabit and that inhabits them.

Place-based education as a framework for school Geography, suggests a radical departure from the status quo. Its adoption would of course not mean change overnight but a process of change that does present challenges for all those with a vested interest in school Geography. Taking up these challenges

[7] A quick response codes is a type of 2D code that is often used to provide information rapidly on a mobile phone.

will not be easy and will 'inevitably involve sweat, personal risk, intellectual daring and inconvenience' (Orr 1992: 166), which may run counter to the modes which currently dominate school Geography curriculum practice.

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# Through the Lens of Teachers: The Use of Geography CAPS Textbooks, Concomitant Challenges and a Reimagining of the Textbook

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## Abstract

The latest school curriculum offering in South Africa, has been the introduction of the Curriculum and Assessment Policy Statement (CAPS) in 2011 and this has logically been followed by the production of new textbooks in 2013 aligned to the current education syllabus requirements. This paper examines the use of the Geography grade 11 and 12 CAPS textbooks and the challenges experienced by teachers (as articulated by them) in their use in two poor provinces that lie on the eastern coast of South Africa. The data emanates from a northern and southern hemisphere Geography Textbook and Pedagogy mixed methods study involving Norway, South Africa (SA), Swaziland and Zimbabwe. This paper utilizes the data generated from two instruments namely questionnaires and interviews from the South African data sets in the following two poor provinces: Eastern Cape and KwaZulu-Natal. Selected theoretical filaments deriving from Bates and Poole's (2003) SECTIONS model (a refinement from Bates, 1995, ACTIONS model) and Kasule's (2011) 'readability' of a textbook, were of significance. The findings on the CAPS textbook use reveal an immense dissatisfaction amongst the Geography teachers. They bemoaned the lack of learner access to textbooks. It was evident that textbook shortages negatively impacted on effective teaching and learning thereby affecting learner performance in the final years of schooling. Teachers also expressed their disappointment at many of the textbooks' quality with respect to inadequate and insufficient geographic content, decontextualised material, extraneous examples and some incorrect information. There were concerns that some of the current textbooks did not adequately acknowledge


Print ISSN 1023-1757; Electronic ISSN: 2519-5476; DOI https://doi.org/10.29086/2519-5476/2018/sp21a3

the needs of learners for whom English is a second language in these provinces. The authors recommend a reimagining of the CAPS textbooks by stakeholders to address some of the existing challenges in their use.

**Keywords:** South Africa, Geography textbooks, teachers

## Introduction

South African school education has undergone a plethora of curriculum changes upon becoming a democracy. This has been as the result of an attempt to remove apartheid influences and to forge a curriculum best suited to the needs of the economy (local and global) and all who constitute the local population. The present curriculum amendment (called such because Government documents do not express it as a new curriculum, but rather a refinement), is called the Curriculum and Assessment Policy Statement (CAPS) (Department of Education 2011). It was introduced gradually in a stepped fashion across selected grades with the first exit examination (called matric/ grade 12) for high school learners in 2014. CAPS was gradually implemented over three years, starting with Grades R to 3 and Grade 10 in January 2012. In 2013, schools implemented CAPS in Grades 4 to 9 and Grade 11, followed by Grade 12 in 2014. Presently there is a dearth of research related to this latest curriculum addition CAPS, the textbooks that have been produced which are aligned to it and the discipline of school Geography in SA. This paper aims to partially fill that gap on the CAPS textbooks. This paper specifically aims to make an empirical contribution to high school geography textbook research in the context of SA, a country which has a transformational agenda to pursue. It examines teachers' use of the new Geography grade 11 and 12 CAPS textbooks and the challenges in its use as articulated by teachers in two poor provinces (Eastern Cape and KwaZulu-Natal) of SA.

We began this paper with a brief discussion of curriculum change post-apartheid. We now proceed below to an examination of the literature, which highlights the challenges facing sub-saharan African countries concerning textbooks. Thereafter, significant theoretical influences for this paper are discussed, which emanate from the field of instructional technology/resources. We then explain the methodological design of the study, which is then followed by the findings on teachers' use of the Geography CAPS textbooks and their

related challenges. A discussion of the main findings trails this and we conclude by arguing for a reimagining of Geography CAPS textbooks to obviate the current challenges experienced in these two poor provinces. Herein we draw on the critical insights distilled from sub-Saharan education textbook researcher, Verspoor (2008) and seminal Geography vulnerability researcher, Cutter (1996).

## A Glimpse at the Nuances of Textbook Research and School Geography

Textbooks are an example of instructional technology. It is valuable to unpack the meaning of instructional technology and Omariba (2012: 24) uses Brown *et al.*'s (1973) definition of instructional technology which is an all encompassing definition: 'a combination of resources including people, materials, machines, facilities as well as purposes and processes that support effective and meaningful facilitation of learning'. There is consensus that textbooks are a category of instructional technology (Ayot 1986; Omariba, 2012). Instructional technology is sometimes called instructional/ pedagogic resources.

Textbook research as a field of study is extensive: spanning across countries and continents, and going back decades (Tsang 1933; Auerbach 1965). It thus has a rich history and much of the research published about textbooks lean on them being responsible for transmitting culture across time (Apple 2013; Bourdieu & Passeron 1977; Morgan 2003) and for housing what is considered to be 'legitimate' knowledge in society (Apple 2013; Blaut 1998). The focus of many of the textbook studies outside of Africa across recent decades has been largely on national identity in textbooks (see Woolf 1996; Schiessler & Nuhoglu 2005; Nava 2006).

There has been some criticism that in the African continent, there is limited literature in general on textbook research. Kasule (2011) writing in the developing world context of Swaziland, highlights the challenges of textbooks that is being currently experienced: namely that there are large class sizes with inadequate textbooks and centrally chosen textbooks. As with many other African countries, in Swaziland there are nationally composed textbook lists as textbooks have to adhere to the current national education syllabus to be approved by the local departments of education. This is similar to South Africa. Kasule (2011), reports that the textbooks in Swaziland have unfortunately been

used for generations (due to a lack of curriculum change for quite some time) and therefore at the level of schools, they are in a poor condition from continuous use.

Despite the critique on the African continent about textbook research, substantial textbook research has indeed been undertaken in South Africa (Koross 2012). Locally, disciplines like History and Commerce have made inroads by undertaking textbook studies providing insights into a cross section of subfields like heritage, race and social justice (gender and inclusivity etc.). (see Nkwenti 2012; Pillay 2013 ; Maposa 2015 ). Much of the research in SA on textbooks have thus been confined to the subject of History and to a lesser extent to other subjects such as Commerce. The limited studies into textbook content in school subjects have also not been directed towards studies in high schools, as is reported on, in this paper. For example, Bryce (2011) writing from the SA primary school context on reading challenges particular to Science textbooks argues that textbooks are non-fiction and therefore a new genre for learners to begin to master as learners are not encouraged in their formative years to read such textbooks. She presents five consistent challenges experienced in classrooms drawing on evidence from available literature and from an empirical study analysing discourse and interactions between teachers and their learners. These challenges are as follows (Bryce 2011: 475):

- difficult technical language;
- dense presentation of concepts;
- superficial treatment of topics;
- information delivered in a dry, uninteresting manner; and
- a lack of organization and reader-friendly style.

Internationally, school Geography textbooks have been spotlighted in recent years from a critical geopolitical lens unpacking for example the dominant discourses in the textbooks (see Ide 2016) and representations of the 'other' (Mikander 2016). However, Geography textbook research has been sparse in the African continent and SA as mentioned above (Manik 2008; Beets & Le Grange 2005; Ngubeni 2009; Wilmot & Dube 2015). Noticeable though is some valuable contributions to this field by SA geographers Ngubeni (2009) and Naidoo (2013) who analysed aspects of knowledge in Geography textbooks. It is important to remember the assertions of Rotich (2004) writing

about Kenya and Kasule, (2011)writing about Swaziland, that textbooks occupy a privileged position in classrooms in African countries with a colonial past. Therefore, in such countries, as is SA, textbooks are a significant tool for learning and perhaps the sole resource supporting teachers' articulations in certain schools. The value of textbooks for both teachers and learners should thus not be under-estimated as Raselimo (2014: 131) reported in a study that Geography teachers in Lesotho who lacked conceptual knowledge, were using a textbook to access content knowledge which they did not have, rather than using the textbook as a 'teaching resource.' Thus SA Geography textbooks are in dire need of being examined in studies given the array of school Geography textbooks that have been published since the early 1990's as part and parcel of the various democratic curricula changes from C 2005 onwards.

## Logistical Issues on School Textbooks and Learner Performance

South African schools and textbooks have been in the limelight for all the wrong reasons in the past few years – lack of/ late delivery to poor provinces. The South African Human Rights Commission (2013) upon the mandate of parliament undertook an investigation into textbook delivery and commented that 'The implementation of the new curriculum has been beset with considerable difficulties arising from lack of delivery or late delivery of textbooks and workbooks to learners or the delivery of the incorrect learning materials'. Limpopo, a poor province, and four other SA provinces have opted for a school based procurement model where funding is transferred to a service provider to supply the books after schools make their choices. Both the Eastern Cape and KwaZulu-Natal, which are the cases for this paper, have what is termed a hybrid procurement system of sourcing their textbooks. This entails funds from the provincial department of education being given to schools, which then procure their own textbooks. Schools in both these two provinces were given the option of changing to a centralized textbook procurement system (SAHRC 2013). Interestingly Limpopo, Eastern Cape and KwaZulu-Natal (KZN) 'outsource the facilitation of their procurement to what is termed a management agent' (SAHRC 2013: 24). The SAHRC report notes that in respect of the delivery of textbooks, that by December 2012, 95% of textbooks had been delivered to the Eastern Cape (EC) but no information on the 2013

textbook delivery was available. By contrast, KZN received 100% of its textbooks by the end of 2012 and 99,46% in 2013. Thus, textbook delivery in the EC appears to be lagging behind that of KZN. In respect of the other provinces, textbook delivery were as follows: Limpopo reported delivery of 99% and 99,7% of textbooks in both the years. Provinces such as the Western Cape and Mpumalanga reported a 100% delivery in 2012 and 2013.

## Quality in Textbooks

The value of sufficient textbooks of good quality should not be underestimated. There is sufficient literature (interestingly, most of which emanates from primary schools again) which supports the view that textbooks have a positive impact on student learning (Verspoor 2008:236) thus quality school textbooks are a necessity for learners. Verspoor adds that he believes that 'the conclusions in his study apply perhaps even more forcefully to secondary education'. He argues that if there are inadequate textbooks then learners will not reach the threshold levels of learning. In his study on several countries in Sub Saharan Africa, he (2008: 236) acknowledges the harmful impact of high textbook costs on learner access, stating that 'high unit costs of textbooks often result in extremely low availability'. Manik (2008) similarly noted this finding a year earlier on the high costs of post-apartheid textbooks in SA impacting on learners being unable to afford to purchase. The argument that learners should have access to sufficient learning resources is also evident in Mudulia's study (2012: 535) which reported that 'Schools with adequate resources were found to perform better than those without'. An interesting caveat comes from Omwenga (2001) who is critical in his contention that there are many teachers who complain about a deficiency in instructional resources, but they are responsible for not using what is available.

## Theoretical Architecture

Part of the theoretical architecture for this study draws on the SECTIONS model (Bates & Poole 2003) which is an improvement on Bates (1995) ACTIONS model that addresses decision-making in the use of instructional technology/ pedagogic resources in the classroom. For this article, we prefer to use the concept 'instructional/pedagogic resource' (Walton & Ruck 1975) as

'instructional technology' does carry the connotation of some form of digital advancement (computer software) as Hooper and Reinartz (2002) purport. The resource being examined in this article is the paper version/ hardcopy grade 11 and 12 Geography textbooks which have a long history of physical use and can thus not be considered to be digital although some textbooks may be accompanied by a computer disc.

Another theoretical strand relevant for this paper comes from Omariba's study (2012) which investigated the types of instructional resources used and the challenges experienced by teachers and learners in secondary schools in Kisii County, Kenya. Omariba (2012: 15) argued that the 'use of instructional technologies' (pedagogic resources) are responsible for accomplishing 'mediated learning' that is 'simple, enjoyable and stimulating for the learners'. Omariba thus eschews three facets to the pedagogic resource: it has to be simple to read, enjoyable and stimulating for learners – in the case of the present study, these features of the textbooks have relevance. For this study, the specific pedagogic resource is the newly crafted Geography CAPS grade11 and 12 textbooks published in 2013. In the Bates (1995) model which Omariba (2012) draws upon, 'ACTIONS are an acronym for the description of a set of tasks central' not only 'to the informed selection' and also to 'the use of instructional technologies in classroom teaching' (Omariba 2012:12). The refinement of this model has value for us and our use of selected elements of the refinement are explained below. Although the SECTIONS model and its predecessor were initially crafted for distance education, it has been utilized in face-to-face teaching environments and 'has been found to be adaptable to various formal and informal teaching environments' (Bates & Poole 2003: 78).

In the original model,

**A** therefore stands for accessibility of the textbook;
**C** is for cost of the textbook;
**T** is for Teaching and Learning – what instructional methods are needed in using the textbook;
**I** is for Interaction and User friendliness – the nature of the interaction between teachers, learners and the textbook;
the **O** is for organization – the types of organization required for facilitating the use of the technology-textbook/s; what are the barriers to using the textbook successfully?

the '**N**' has been omitted for use because N stands for novelty – how new is the technology and what are its features and textbooks are not a new resource although the CAPS textbooks are recently produced; and
the **S** stands for speed, the swiftness with which teaching can unfold using the resource of the textbook.

In the SECTIONS model, a refinement of the ACTIONS model, 'ease of use' and 'interaction' are separated as criteria as Bates and Poole (2003) believed that if the resource is difficult to use it will impact on learning thus warranting it to be a separate criterion from interaction.

In this improved model,

the **S** is for students – what is known about the learners and how appropriate is the textbook for them;
**E** is for ease of use – how easy is the textbook for use;
**C** is for cost – the cost of the textbook for each learner;
**T** is for teaching and learning – 'the kinds of learning that is needed' and the pedagogical approaches required for this learning;
**I** is for the kinds of interaction this resource allows for;
**O** is for the kinds of organisation this resource requires and the barriers to be eliminated to maximize the use of the textbook;
**N** is for novelty – how new is the textbook; and
**S** is for speed – how quickly can this textbook facilitate the course/ subject.

It is thus evident that access now is collapsed within the category of students (which we will call leaners as this paper relates to school and not higher education in the SA context) and the other change is just the separation of ease of access as a separate criterion. Interestingly, the first and second models were fashioned for teaching in a digital age and therefore we as the authors contend that there are aspects of the models which are not suitable for this present study on hardcopy textbooks. We thus trim away that which is deemed irrelevant to hardcopy textbooks and alter others for our use in this paper.

Because the majority of learners in SA are African and English, the medium of instruction in KZN and EC high schools is a second or third

language for them, the aspect of 'readability' of the textbook, is salient. Thus theoretical insights into readability is significant and aspects of readability can be linked to the 'S' in the ACTIONS model. We thus glean from the work of Kasule (2011) for this. Kasule (2011: 63) researched textbook readability in Swaziland, South Africa's neighbour. He emphasized the concept of the 'readability' of a textbook and explained that readability is 'simply as the ease or difficulty with which the textbook may be understood' (Kasule 2011: 63). Kasule further states that there is, 'a heavy responsibility on the quality of the textbook itself in meeting appropriate criteria regarding the learner's age, educational and cultural background, and linguistic proficiency'. He explains that linguistic proficiency can refer to the language contained in the textbook which learners have not yet achieved mastery of or it can refer to the discipline specific (technical concepts pertaining to each topic)language or to both of these ideas. Kasule (2011: 66) explains that 'working with academic texts that are written in a language in which one is not competent, as is the case in ESL classrooms, is not easy'. This idea has a link to Omariba's (2012) assertion of the textbook needing to be 'simple'.

## Methodology

This paper derives from an ongoing north-south Geography Textbook study which commenced in 2016. The study was located within the interpretivist paradigm as the aim of the study was to explore teachers' experiences in terms of their use of the Geography CAPS textbooks published in 2013 and their related experiences and challenges. The participants were teachers from public schools who were teaching Geography in grades 11 and 12. The data presented and discussed in this paper is extracted solely from teachers located in two provinces in South Africa that have a hybrid system of textbook procurement, as stated above. Thus one of the limitations of this study is that the provinces of SA with a school based procurement method are not included. A collective Case study approach was used for the umbrella study, with the idea that 'greater insight into a research topic' can be gained 'by studying multiple cases' (Johnson & Christensen 2014: 436). Yin (1994) also refers to this as multiple case design. The cases are generally studied in an instrumental fashion rather that an intrinsic way (Johnson & Christensen 2014). They also contend that this approach allows for comparative studies and the ability to generalize

from the results possible. The aim of the larger study from which the data was extracted for use in this paper, was to explore the choice of Geography textbooks in terms of what Geography textbooks were being selected at schools, how the textbooks were being chosen (which were favoured textbooks) and why were particular textbooks selected. In addition, teachers' use of the textbooks were explored including the challenges being experienced in terms of the current offering of Geography CAPS textbooks in high school. The larger study used a mixed methods approach and two instruments were used for data generation in each country context: namely questionnaires and interviews. The trustworthiness of the data was enhanced by having multiple methods of data generation (Creswell & Poth 2018). In total, for the large SA data set, data was generated from Geography teachers located in five poor provinces: Limpopo, Mpumalanga, Northern Cape, Eastern Cape and KwaZulu-Natal. An area for future research would be to include SA's other provinces. Purposive sampling of the cases were used because it 'illustrates some feature or process in which we are interested' (Creswell & Poth 2018:148). Hence, the two largest data sets, with provinces using the same method of textbook procurement, were selected for discussion in this paper.

Geography teachers were located for participation by the existing Geography Education networks in higher education institutions in each of the provinces. Thus, Geography education lecturers used their links with Geography teachers and also their postgraduate students who could link them to Geography teachers as the initial sample. That is convenience sampling was first used. In addition, snowball sampling was thereafter used to draw in a larger data set using initial participants to suggest one or more of their geography colleagues who were teaching in the same grades.

The relevant ethical procedures were followed. All participants completed a consent form and were at liberty to withdraw from the study at any time should they choose to do so. All participants were also given pseudonyms to protect their identity. Reliability and Validity are important issues in all research (Lacey & Luff 2001) and trustworthiness of the data was ensured through the following ways: the gathering of thick, rich data via open ended questions in the questionnaire and follow up questions in the interview and member checking of transcripts.

Out of an initial 60 questionnaires which were handed out, a total of 45 questionnaires were returned (n=26 for KwaZulu-Natal and n=19 for the Eastern Cape) equating to a response rate of 75%. These questionnaires

contained numerous open-ended questions which were qualitatively analysed. A total of 6 interviews were held face to face with participants in KZN and none in the EC due to logistical and financial reasons (such as the costs to travel to remote locations to interview one teacher face to face). Teachers who completed the questionnaires had to indicate on their consent form if they would consent to a follow up interview to probe their qualitative responses in depth and if agreeable, provide their contact details.

The first part of the questionnaire gathered data on the biographical and professional profiles of teachers in the schools, how the geography textbook/s were being selected for purchase, and what were the favoured textbooks by the teachers. The open ended questions allowed for data to also be generated on how the textbooks were being used (in preparation, homework, classwork, assessment, during which part/phase of the lesson (introduction, middle, conclusion), teachers' views on the CAPS textbooks and the challenges they were facing in the use of these textbooks. In attempting to resolve their challenges by re-imagining textbook use, the approach we used was heuristic. The interview schedule additionally attempted to gather indepth data on teachers' favoured textbooks and their use of the textbooks and its related challenges. It also probed teachers' views on the nature of the CAPS Geography textbooks they were using to access textbook quality. The questionnaire and the interview schedule both included a question on teachers' additional comments related to the geography textbooks, in the event that the study may have overlooked any interesting aspects in need of probing in respect of the use and challenges in teachers' use of the CAPS Geography grade 11 and12 textbooks.

## Findings

The findings discussed below illuminated teachers' use of the grade 11 and 12 Geography CAPS textbooks prior to, during and after lessons and the concomitant challenges they experienced in using these textbooks.

### *Teachers' Use: The Textbook at the Epicenter of Lessons*

It was evident from the questionnaires and interviews that Geography teachers in the two poor provinces of SA were using the textbooks extensively for a range of purposes from pre-lesson to post lesson: in preparation of their

lessons, for classroom teaching, for their assessments, and for homework. It was evident that the CAPS textbooks were a salient part of Geography teachers' pedagogy. Q25 KZN[1] stated, '*the textbook is used throughout the lesson*'. Q13 KZN explained that there is a dependency by all teachers at her school including herself on textbooks, '*There is a heavy reliance on the textbook in my school. It is the main resource in the classroom …*'. During classroom teaching, in what is commonly termed the normative 3 part lesson, the selected textbook was used in all parts: introduction, development and conclusion of the lessons. Teachers articulated the view that the textbook served a central position in the classroom and it appeared from teachers' articulations that there was a dependency on the textbook: '*learners have to refer to somewhere and textbooks serve that purpose'* (Q 14 KZN).

The development of the lesson was the favoured space for textbook use. Geography teachers asserted that the development is largely where textbooks are used as '*it helps to deliver the content easily*' (Q 21 KZN) and it allows for consolidation of information from different textbooks: '*during the middle (of the lesson) is where you can combine different information from different textbooks*' (Q6 EC[2]). This is especially pertinent as visual information (diagrams and pictures) and case studies are a necessity in teaching within the discipline of Geography.

It was found that the majority of teachers in the sample, felt the need to refer to multiple textbooks for different purposes. Teachers were referencing textbooks in preparation for their lessons (CAPS textbooks and at times textbooks produced pre democracy). However, in class they would only use the one CAPS textbook which learners could access and that they had decided upon within a specific cluster of schools for standardization as the grade assessments are prepared by teachers from various schools within the cluster. This is articulated by Q16 KZN who explained, '*I use the same books mentioned above because we also have papers that are common as a cluster, therefore it is important to share the same information as well*'.

Due to Geography comprising of numerous sub-disciplines, teachers were also inclined to access different textbooks for different sub disciplines within Geography. They would find one textbook with a better approach to the

[1] Q25 KZN is questionnaire number 25 with the participant from KwaZulu-Natal.

[2] Q6 EC is questionnaire number 6 with the participant from the Eastern Cape

content or addressing a sub discipline with more content knowledge. For example, a teacher explained: '*Via Africa and Study and Master make it easy for learners to understand the content. Excel is good for mapwork'* (Q 16 KZN). They would then use that particular textbook for information but this textbook may not have been purchased by the school for use by learners. For example, in the sub discipline of mapwork which has been proving to be challenging for Geography teachers and learners across SA (as is evident in the matric results), the teachers would inform learners about these additional textbooks but the onus would be on learners to purchase them independently of the school for their own use.

With regards to the CAPS textbooks, Geography teachers asserted that they referenced numerous CAPS textbooks for different purposes especially due to a lack of content. For example Q7 EC explained: '*We need to refer to different textbooks as one textbook may provide less information'*. Similarly, Q8 KZN, stated, '*I use a variety of textbooks to draw more content and gather more resources, tasks and activities*'.

## *Textbook Use during Lessons*

### *Access to Multiple CAPS Textbooks*

Despite teachers alluding to the use of multiple textbooks, they are inadvertently denied access to multiple textbooks by their schools as only one textbook per subject is purchased for use. Teachers advanced the following comments in their questionnaires: Q13 EC ' *No, I don't have access to all of them*'; Q16 EC '*It's the only resource that I have in my school, I don't have access to other resources*', Q18 EC, '*I chose to use the one that I'm using because it is the only resource that I have'*. It must be noted that where teachers do have additional textbooks at school, it is because a publisher has left a free sample copy at the school for the teachers to order the textbook after perusal, which is then held onto by the teacher for his/her own use.

Some teachers did explain how they managed with having no textbooks purchased across the years except for the sample copy of the CAPS textbooks. They photocopy and make duplicate copies for learners from the chosen textbook. For example, Q21 KZN stated *'... there is only 1 copy for me to use, it requires me to make handout photocopies all the time*'. This reproduction of the textbook is illegal and the teacher did acknowledge

knowing this but he felt that it was his way of managing a lack of Geography textbooks for his grade 12 class in a poverty stricken school.

Despite the centrality of the textbooks to teacher pedagogy, teachers complained extensively about the challenge of a shortage of CAPS textbooks for their learners and the ripple effect of this shortage on the nature of their pedagogy and the timeous completion of the grade 11 and 12 curriculum. This is detailed in the discussion below.

## *An Old Story – Of a Shortage of Geography Textbooks for Learners*

Teachers' most prominent challenge with the CAPS Geography textbooks in terms of its use was that of learner access to the CAPS textbooks. They complained of not having adequate textbooks for their classes to use during lessons and for homework purposes. It was evident from both instruments (questionnaires and interviews) that the shortage of textbooks for learners was because of how purchases were made by the schools in both provinces. Comments point to textbook shortage as a common ongoing challenge thwarting teachers' attempts of achieving effective textbook use to maximize learning. Some of these comments are detailed below:

> '*Number of textbooks available. Not every learner has a textbook*' (Q11 KZN).
> '… *not all learners have access to textbooks*' (Q16 KZN).
> '*There is a shortage of textbooks to be used by learners …'* (Q20 KZN).
> *'insufficient textbooks for learners'* (Q22 KZN).
> *'shortage for instance the total number of my learners is 100 and I have only 12 textbooks of which they cannot take home'* (Q7 KZN).
> I 2 *says, 'it will be great for every student to have their own copy'.*
> Q 14 EC *'Other schools have limited numbers* (of textbooks*) to give to me'.*

The above comments chronicle a dire shortage of Geography CAPS textbooks in these two poor provinces with many Geography teachers reporting that each learner does not have access to his/her own textbook. It is extremely pertinent

to note that Q7 KZN revealed that there is one Geography textbook per 10 learners to share in the school.

## *Challenge: Cost of Textbooks*

The shortage of Geography textbooks is linked to the cost of the CAPS textbooks and the status of the subject. The schools in both sampled provinces were poor (inadequate funds provided by the department of education to purchase additional textbooks) and thus unable to purchase sufficient textbooks for all learners due to financial restrictions, as is explained by the teachers below.

> '*Shortages … financial constraints*' (Q9 KZN).
> '*The cost of textbooks is very high. School cannot buy for all learners*' (Q23 KZN).
> Teacher I 5 KZN[3] explained that some textbooks are in the region of R160 per book and the favoured textbook '*is about R200*'.
> I 3 KZN similarly stated that a challenge was the *'unit cost of textbooks which limits me in terms of my needs*'. He has a total of 294 students doing Geography and says, '*its financial, the textbook problem'.*

Thus textbook decisions in the schools are taken strategically based on limited textbook purchases for Geography. Teachers also noted that Geography is not considered a priority subject like English/ Afrikaans or STEM subjects and hence a full set of textbooks is never purchased as regularly as with for example English/ Afrikaans due to those subjects' needs.

The link between textbook shortage and the poverty of schools was succintly summed up by I 5 KZN as '*We are restricted by the LTSM budget*'. The LTSM (Learning and Teaching support materials) budget is the government allocated funding instrument that is awarded to schools and used to purchase textbooks. However, school classification according to the quintile system (a sliding scale from 1 - 5) which attempts to provide variable funds (LTSM budget) based on whether a school is deemed to be poor (quintile 1) or more advantaged (from quintile 2 to the most advantaged being quintile 5) appears to be flawed in addressing school poverty.

[3] Interview 5 for a KZN participant.

> I 4 KZN explained '*we are a quintile 1 school (disadvantaged school, that is poor) but with a quintile 5 (advantaged school) ranking. We are rated the same as Queensburgh Girls…we have learners from township and underdeveloped areas…students buy separately from their own pocket and some share cos they can't afford to buy*'.

The above comments by the Geography teachers (I 4 and I 5 in KZN) draws attention to how government funding is allocated to schools and how the present quintile system of funding for schools negatively impacts on the provision of adequate Geography textbooks for all learners. Quintile 1 schools thus receive more money (which can be used to purchase more textbooks) than quintile 5 schools. The quintile system, as explained by I 4 KZN, fails to recognize that there are learners from socio-economically disadvantaged locations attending schools in areas which are socio-economically advantaged and these learners are unable to access a textbook purchased by the school because the ranking of the school translates to a lower LTSM budget which is used to purchase textbooks.

Teachers explained: '*The cost of textbooks is high…there is sharing of textbooks*' (KZN Q 24).

Participant Q 13 KZN explained, the challenges of multiple variables linked to the provision of textbooks negatively impacting on teaching and learning amongst the grade 12s: large Geography class sizes, inadequate textbooks and the sharing of textbooks between Geography teachers and learners across the grade 12s. He explained, '*Due to the large number of students, all learners do not have access to a textbook, there is sharing and we share within our classes and with the other Geography educator and myself'*.

His articulations reveal the logistical challenges of having to cope with a shortage of textbooks and large class sizes. It is evident that the ratio of textbooks to leaners is not 1:1, there are instances described above where it is more than 1: 10 (one textbook to more than 10 learners).

## *Repercussions of Inadequate Geography CAPS textbooks*

There are also numerous teaching, learning and curricula repercussions as well which result from an inadequate number of Geography textbooks for learners per class. These include teachers reporting that there is a wastage of teaching

and learning time in class and that they experience difficulty in completing the grade 12 curriculum timeously.

> ' *shortage of textbooks … so I have to write notes for learners (on the board) and this consumes time*' (Q 20 KZN).
> '*… the department is coming down heavily on poor results*' (I 2 KZN).
> Teachers did suggest that, *'… it would be better if learners have their own textbook that they can go home with it'* (Q 21 KZN).
> I 5 KZN explained, *'most of the time, I write on the board. I use the study guide and my own notes. I don't give learners books to take home …. there's no paper and no ink so I can't turn out. They only gave 12 copies (of the textbook). I was at another school for 12 years and they have all the resources and I used to produce 25 as out of a class of 26. Because there's not enough resources, learners do battle and it does impact on the results*'.

It is clearly evident from I 5 KZN that he has experienced teaching Geography in a well resourced school for numerous years and produced excellent matric results and comparatively he is able to see that a shortage of Geography textbooks is impacting on the learners' performance in the present poor school where he is teaching.

It is also important to note that the Geography teachers explained that they are unable to utilize the textbooks from the previous curriculum offerings due to the requirements for CAPS assessments and because of content changes in the new curriculum. For example, I 2 KZN stated '*some of the grade 12 content has been moved to the grade 11 syllabus*' and also in the '*previous curriculum, there was a focus on activities and not content*' (I 3 KZN).

## *Quality of CAPS Textbooks*

We now turn to the quality of the CAPS Geography textbooks. It was evident that, there were few Geography CAPS textbooks which were considered to be of high quality enhancing teaching and learning in the classroom as expressed by Q 12 KZN of one textbook, '*Excellent resource to use in the classroom with learners*' and Q 17 KZN of 2 other textbooks which were deemed, '*rich in content*'. Other textbooks were merely perceived by teachers to have adequate

content and some were lacking in numerous ways. For example, Q 10 KZN stated the 2 textbooks which she used were '*simple for learners, illustrations can be copied and used in class'.* ; Q 11 KZN stated , '*well illustrated simple diagrams*'; Q3 EC stated that the textbook used was, '*easy for learners to follow*'.

Despite the above articulations by teachers that they were selecting and using textbooks based on aspects of the 'readability' of the textbook, there were overwhelming challenges expressed by the majority of Geography teachers which centred on various quality aspects of the content in many of the textbooks as stated above. Interestingly, the textbooks, which were perceived by teachers to be lacking had passed the Department of Basic Education's quality screening process and made the recommended textbook list. Q14 EC commented on the content of one such textbook, '… *with almost satisfying information*'. These challenges related to textbook quality as reported by the participants, are discussed in depth below. Given the many challenges facing Geography teachers using the textbooks, there was a common view that some of the CAPS Geography textbooks were limited quality wise in multiple ways. The aspects of poor quality that the participant teachers alluded to included aspects related to the written content and the visuals contained in the textbooks.

## *Written Content*

> Q13 EC stated, '*some other textbooks are lacking the information or it's not shooting straight to the point, meaning its full of irrelevant information*'.
> Q 12 EC, '*some information is distorted*'.
> Q 7 and 10 EC amongst others both commented on *the textbooks having* '*wrong diagrams'* and *'a lack of information'.*
> Q 11 KZN stated , '*Certain concepts need greater explanation*'.
> Q 21 KZN , '*if the textbook does not cover all content information, I will have to substitute with another*'.

It is apparent from the above that numerous teachers complained of inadequate, distorted and irrelevant geographic content. This was another challenge facing teachers in their use of the selected textbook:

> The argument of incorrect and confusing information was bolstered by other participants' similar comments. For example: a participant (Q 14 KZN) explained that textbooks referred to concepts differently: ' *topographic rain*' and another textbook called it '*orographic rain'* … *they contain errors*' … '*some have false information*'.

Also, when only one textbook is used for teacher's understanding, that is if the teacher is overly reliant on extracting the content knowledge only from this singular textbook without undertaking research via other textbooks, this has pitfalls. A participant from KZN explained, '*there is some superficial teaching and reliance on 1 textbook … we picked this up at the marking centre … students in the hydrology section were giving the shape (dendritic) instead of the underlying rock structure*' (I 1, KZN).

## *Textbook Visuals*

Teachers also experienced challenges related to the nature of the visuals in the textbooks as is detailed below:

> Q10 EC stated that there were '*wrong diagrams, lack of information*'. Similarly, Q16 EC noted that, '*The textbook doesn't show illustrations, give examples and a memorandum for assessment*'.

Where there were visuals in many textbooks, some teachers did comment on the poor resolution of the pictures and a mismatch between the diagrams and the corresponding content. For example, Q8 EC noted '*sometimes the information is wrong and diagrams do not match with the content*'.

## *A Lack of Alignment between Local Context and Textbook Examples*

Additionally, some of the textbooks contained examples/ illustrations that were irrelevant to life in South Africa, which teachers felt compromised learners' understanding of geographic concepts and phenomena that could impact on building a better understanding of their locality. For example,

> Q10 EC noted that there were '*no local illustrations or examples from our local areas'*. Similarly, Q14 EC stated, '*They always show very far areas*'. Q17 KZN similarly stated that '*some textbooks make or give examples that are outside of your region and country*'.

The absence of contextualised examples were thus another challenge emanating from the CAPS textbooks that hindered learners' conceptual understanding.

## *User-Friendliness of Textbooks*

A major challenge for teachers was the user friendliness of the textbook. Whilst there were many teachers who referred to some textbooks as being simple and easy to follow/ understand (see Q7 KZN), there were some textbooks that were found to be unsuitable for learners for whom English is a first additional language at school. For example, Q2 KZN stated, '*inappropriate language*'. Q19 KZN also explained '*we have a problem with literacy and numeracy skills ... the textbook is about language, they are reading'*.

Teachers also articulated the need for each textbook to have a detailed glossary of concepts which learners could utilize as the learners are mostly English second language learners. For example,

> Q12 EC commented : '*The glossary is important to get definition of concepts*'.
> Q10 EC stated : '*Use of index can help to define most of geographical concepts*'.
> Q9 EC also noted: '*Glossary helps with concepts which needs to be defined by the learners*'.

It was thus evident that the teachers required textbooks to contain two aspects to enhance the readability of the textbook amongst ESL learners: a detailed glossary and an index, which would assist learners to understand new Geographic concepts.

## Discussion

Whilst the CAPS curriculum revision appears to have positive overtones (Wil-

mot & Dube 2015), this paper has presented data in two poor provinces of South Africa which highlight, from teachers' perspectives, that the Geography textbooks which are aligned to this curriculum for grade 11 and 12 Geography, does present numerous challenges. The participant teachers utilized textbooks extensively in all segments of their lessons and they can be thus be perceived pedagogically to be ***textbook teachers*** due to their strong dependency on the textbook. This is not unusual as Kasule (2011) also writing on the role of textbooks in Southern Africa, contends that they occupy a position of privilege in the classroom because textbooks are still the most commonly available instructional resource for schools (Omariba 2012). As far back as 1999, Van Harmelen, reported that in apartheid SA, a textbook approach to teaching was quite evident. It now appears that despite government's several attempts at democratising the curriculum and teachers' roles, teachers in the two provinces of KZN and EC, have not extended their pedagogical approaches. This teaching approach with a strong reliance on the Geography textbook, from introduction to conclusion of the lesson, has not altered over the years from apartheid to democracy.

Despite this textbook reliance, the ***restricted accessibility*** of the CAPS Geography textbooks for teachers and learners was a significant challenge due to the LTSM budget allocation for the schools, which was dependent on the Department of Basic Education's (DBE)'s quintile ranking of the schools. ***High unit costs of textbooks*** and differentially priced Geography textbooks influence the quantity of geography textbooks, which are eventually purchased. Geography is also not a high status subject at SA schools and other subjects higher up in the hierarchy were subject to preferential textbook orders. Thus, the languages and STEM (especially Science and Mathematics) departments received CAPS textbook purchases more frequently because management is more understanding of their requirements. There are SSA countries which are struggling with large classes, that is teacher-learner ratios are high, for example Malawi (Nampota 2011) and Swaziland (Kasule 2011) and their findings echo in the two provinces of SA in this study. Thus the findings resonate with Kasule's (2011) that classes are large and that there is a shortage of textbooks. Correspondingly, socio economic imperatives at the schools impact on learners' access to textbooks and consequently learner achievement: learners in poor provinces rely on the purchase of textbooks via the school because they are poor and unable to purchase their own text-books.

Geography CAPS textbook orders placed by the school management were thus never full sets to cater for each learner and hence learners and teachers were sharing textbooks. This sharing of textbooks amongst learners and the borrowing of textbooks between classes were teachers' attempts at managing the limited textbooks at a micro level regardless of the high ratio of learners to a textbook. The agency of some Geography teachers was thus evident in their coping mechanisms linked to the high unit cost of textbooks and inadequate textbooks in class.

Omariba (2012) reported in a textbook study that completing the syllabus on time for adequate preparation of the exit examination is essential. Hence, the loss of time suffered by Geography teachers in KZN and EC due to a shortage of textbooks has negative repercussions for learners' performance in the high stakes matric exit examinations. Other scholars also commented upon this. For example, Bryce (2011: 474) found that 'most of the low performing schools were located in the low socio-economic neighbourhoods'. Masitsa (2004) found that there were four critical determinants of underachievement among township secondary school learners in SA: and one of these was the shortage of textbooks. Mudulia (2012: 531) additionally reported that 'the need for course books and revision books in the ratio of 1:1 cannot be overemphasized if learners are to do extra work on their own'. Thus studies have indicated that SSA countries have a longstanding challenge of inadequate textbooks and SA is no different and this has a negative impact on learner performance. In democratic SA, when the African National Congress came into power as the ruling party, there was political rhetoric of a 1:1 ratio of learner to textbook as a target to achieve (SAHRC 2015 b). More than 20 years into a democracy with the ANC, this has not occurred. In 2015, the SCA held that 'the law is clear …. The DBE is obliged to provide a textbook to every learner to ensure compliance with section 29(1)(a) of the Constitution. We must guard against those who are most vulnerable. In this case we are dealing with the rural poor and with children. They are deserving of Constitutional protection' (SAHRC 2015 a). The ANC is still ruling, and this court ruling of three years ago has not reached fruition. The shortage of textbooks will not abate anytime soon with growing numbers of matriculants and annual complaints of late delivery of textbooks for matric learners in poor provinces which continues to engender rage from lobby groups (SAHRC 2015 a). It is evident that ***the costs of textbook production remain high and so does the need for textbooks.***

Interestingly, teachers were selecting textbooks for use based on the readability of the textbook (Kasule 2011), the textbook needing to be 'simple' (Omariba 2012) and caveats such as learners' needs, ease of textbook use and the cost (Bates & Poole 2003) of the pedagogic resource. Teachers were thus selecting textbooks for use by largely ESL learners. Catering for ESL learners because they are not proficient 'linguistically (Kasule 2011) is essential for the majority of KZN and EC learners who are African and for whom English is a second language. The teachers articulated numerous challenges they were experiencing related to the quality of the current CAPS textbooks, which is of concern as these textbooks have passed a screening process by the DBE. Teachers' critique of textbooks should be viewed in a positive vein as these local teachers are in a position to comment and challenge the content given their Geography knowledge base. Recently, Biddulph, Lambert and Balderstone (2015) also noted that Geography teachers in the UK appeared to be quite critical of their textbooks. The quality of the local CAPS textbooks related to numerous issues, most especially that CAPS textbooks were ***content deprived.***

It was evident that the teachers sampled were utilizing multiple Geography textbooks as reference material in preparation and during their lessons. They did report on limited content knowledge (in building conceptual understanding for themselves and learners) in some of the CAPS textbooks (those textbooks that they could access via the school LTSM budget). Interestingly, the CAPS curriculum was reported as a return to a content based curriculum (Wilmot & Dube 2015) and yet the textbooks still appeared to be content deprived according to the participating grade 11and 12 Geography teachers. The CAPS textbooks have been approved at national level and Blaut (1998: 46) notes that the textbook due to its screening process by the department of education is 'a vetted social statement of what is considered valid and acceptable for entry into the mind of the child'.

Participant teachers expressed disappointment that some of the screened textbooks contained incorrect, limited and decontextualized geographical information and were thus lacking in appropriate quality for their grade 11 and 12 learners. Another previous study on textbooks in Africa also drew attention to how textbook authors were glossing over topics (lacking in depth), fell short of easy navigation by the readers, and contained disciplinary language that was dense. Drawing on Raselimo's (2014) concepts of 'inter-discursive relations' and 'decontextualisation', it is evident that the teachers in the present study did expect the CAPS Geography textbooks to integrate

geographical vocabulary and content with local knowledge and link topics with local issues in the country in the form of examples/ case studies.

Incidentally, the quality of Geography textbooks is not only a concern in this particular study, and as recently as 2014 and 2015, it was of concern in England and the Publisher's guide of 2015 sought to provide guidelines on how to ensure the requisite quality in Geography textbooks. Lee and Catling (2016:12) reported that Geography textbooks should contain: ' the author's voice which should appear clearly in the subject context, the focus on geography content, and its selection including the use of 'real life case studies', the provision of challenging tasks which involve reading and interpreting text, graphs and maps, and thoughtful design of the book and its layout. Such a resource should support teachers and be accessible and easy to follow for pupils'. Evidently, this is not the case with some of the CAPS textbooks given the local teachers' critique.

## Recommendations and Conclusions

A significant aspect of the findings, revolved around SA teachers' experiences of the shortage of the CAPS grade 11and 12 Geography textbooks. This signaled a plethora of challenges on access and use of CAPS textbooks that largely hinged on school poverty by virtue of the teachers being located in the poorest of provinces of SA with low human development indices (which measures life span, knowledge and standard of living). Statistics South Africa's (SSA) report (2017:14) on poverty trends between 2006-2015 revealed that inspite of a drop in poverty between 2006 and 2011, poverty began rising in 2015 and 'the country has lost ground in the war on poverty'. SSA (2017:18) revealed that 'in general Black African females, children (17 years and younger, people from rural areas, those living in the Eastern Cape and Limpopo and …are the main victims in the ongoing struggle against poverty'. Thus schools trapped in poverty denote a cycle of disadvantage that threatens to not only entrench but exacerbate the historical suffering of learners from poor contexts such as those who are located in KwaZulu-Natal and the Eastern Cape provinces of SA. The sharing of textbooks by learners is clearly a stop-gap measure implemented by teachers that is not sustainable and it negatively impacts on achieving quality teaching and learning. Clearly textbook shortages hinder learners' performance outcomes in these poor provinces.

In the nineties, acclaimed risks and hazards Geographer, Susan Cutter (1996) conceptualized a model of vulnerability based on place, called the hazards of place model. Indeed KwaZulu Natal and the Eastern Cape are also conceptualized as vulnerable provinces due to poverty. But, there is a need to move away from the normative lens of the vulnerability of these provinces to how they can be propelled to germinate resilience as Cutter's later work demonstrated. Locally, this will be in attempts to creatively address a lack of Geography CAPS textbooks in the classroom which is undoubtedly compromising quality teaching and learning.

***Resilience*** related to the use of Geography CAPS textbooks can be developed through a multi-pronged, multi-level re-imagining of the textbook in an attempt to obviate some of the challenges. As was evident, some teachers were already demonstrating resilience in numerous ways. They shared textbooks amongst learners and between themselves. They were critical of the textbooks and they were sourcing multiple textbooks for content, being well aware of the poor quality of content in some of the textbooks and resorting to using others to supplement the content knowledge for learners. The Geography teachers identified the user-unfriendliness of certain textbooks given their ESL learners and they acknowledged that they were using multiple textbooks in their own preparation of lessons in an attempt to boost lesson quality. However, other ways of developing resilience can be promoted:

**Macro level:** The SA government does not regulate the costs of the textbooks on their approved list, this is a change at the macro level which is needed: for government intervention together with publishers. The buck does not stop with textbook approval via a screening of the textbooks by government, because the bottleneck is in the price of the Geography textbooks, a point I raised 10 years ago in another textbook study (Manik 2008). Government and publishers need to reimagine their respective roles in the provision of adequate textbooks for access by learners if learner performance in the poorest provinces in SA is to be addressed with the seriousness it rightfully deserves. Additionally, textbook publishers do need to revise their textbooks to incorporate contextualized, correct information with a level depth for the required grade of learners.

**Meso level:** Schools do need to reimagine their role in the provision of access to textbooks for their Geography learners by exercising their agency and

maximizing the use of their libraries. This was also a key suggestion by Verspoor (2008) on the underutilization of libraries and ways on how libraries could assist to address the textbook shortage. Schools need to purchase multiple copies of subject textbooks for their libraries to place on reserve for learners to use when ever they have time: during school hours, mornings and afternoons. Teachers also need to motivate school management to assist with innovative ways to meet their discipline requirements. Therefore, if there is inadequate funding to buy an entire set of CAPS textbooks, schools should rather buy a few copies for the library instead of having to wait a few years until there is adequate funding for an entire set of Geography books. The corporate sector can also be a source of textbook sponsorship for schools.

**Micro level:** There are teachers who did reimagine their role in accessing textbooks for use in their classes through sharing of textbooks, but the school did not timetable Geography in the grades in such a way to prevent subject clashes. Thus, creative timetabling of the Geography periods for the same grade could alleviate this experienced challenge. This was also a suggestion by Verspoor (2008) in his study of textbooks in SSA. It is evident that teachers need to exercise their agency and work with school management and industry on finding sustainable solutions for textbook challenges at grassroots level.

Hence, a re-imagining of geography CAPS textbooks is direly needed: A lens that's not tinted towards an ongoing cry for one textbook per learner. This lens should endeavor to address as many of the current challenges of the CAPS Geography textbooks and teachers' use of the textbooks through resourceful strategies as some Geography teachers have been demonstrating resilience in their attempts to compensate for the lag in quantity and a lack of quality of the current Geography CAPS textbooks for grades 11 - 12. This of course does not exonerate either publishers of the textbooks and government who will need to re-examine the grade 12 textbooks for the quality concerns raised above, given the challenges that the teachers reported.

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*Through the Lens of Teachers: The Use of Geography CAPS Textbooks*

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# Geography Educators' Perceptions of Learner Performance in Grade 12 Geography in Public Schools

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## Abstract

This research study arose out of the perceived poor performance of learners in Grade 12 geography from schools in the uThungulu District. To investigate the cause of the poor performance, the researcher explored Grade 12 educators' perceptions of some of the challenges that could affect the academic performance of Grade 12 geography learners. The mixed method study was used to explore the educators' perceptions. Data were collected from 50 educators who were selected through random and purposeful sampling to participate in both the survey and semi-structured interview. Of the 50 teachers, 40 were selected by means of systematic random sampling to fill in the questionnaires, while 10 were selected through purposeful and convenient sampling to participate in the semi-structured interview schedule. Data collected from the survey were analysed using t-test and Pearson product moment correlation coefficient and descriptive statistical techniques. The findings reveal that gender characteristics of educators, and educators' teaching and marking experience were found to be significantly related to learners' performance in geography in public high schools in the uThungulu District. The results reveal that educators' teaching and marking experience significantly contributes to educator competence in the assessment, and learners' answering of national examination questions.

**Keywords:** Educator characteristics, teaching experience, educator qualification, learner performance


Print ISSN 1023-1757; Electronic ISSN: 2519-5476; DOI https://doi.org/10.29086/2519-5476/2018/sp21a4

## Introduction

Geography is one of the most important subjects in secondary school education that equips learners with spatial competence to make them functional in life (Kerski 2011). It is a subject that builds young people's own experiences, develops intellectual skills and helps them find answers to local issues affecting their lives as it introduces them to distinctive investigative tools such as maps, fieldwork and use of powerful communication technologies (Gikunda 2016). The need for improved Grade 12 geography learner performance, as noted by Kimathi (2015), cannot be overstated considering high post-matric expectations, Geography is one of the examinable subjects in the school curriculum, but its enrolment and performance have been declining, and this poses a serious challenge for the schools (DBE 2015). Learners' performance in matric attracts the attention of all those involved in the teaching and learning profession. The recent concern for the stakeholders, including the Department of Basic Education, curriculum planners, parents and learners is the poor performance of learners in the final examination.

In recent years, there has been some notable decline in the quality of performance in the matriculation examination in geography as shown in Table 1 below (DBE 2014). The assessment of the NSC examination results six years' cycle for 2009 - 2014 has shown a pattern of considerable decline. Although this phenomenon is consistent with other optional subjects, and the percentages are higher than for mathematics and the sciences, it has raised concern for educators, parents and government over the years. The main concern from the geography educators in the main has been the quality of performance shown by Grade 12 learners in the subject (Innes 2012; Kimathi 2015; Gikunda 2016). Several scholars argue that this situation is not unique to the South African context.

**Table 1: Performance of learners in geography in the NSC examination in the uThungulu District from 2009 to 2014**

| Year | No. wrote | No. achieved at 30% and above | % achieved at 30% and above | No. achieved at 40% and above | % achieved at 40% and above |
|---|---|---|---|---|---|
| **2009** | 215 120 | 155 481 | 72.3 | 84 279 | 39.2 |
| **2010** | 209 854 | 145 187 | 69.2 | 85 241 | 40.6 |

| | | | | | |
|---|---|---|---|---|---|
| **2011** | 199 248 | 139 405 | 70.0 | 84 169 | 42.2 |
| **2012** | 213 735 | 162 046 | 75.8 | 99 760 | 46.7 |
| **2013** | 239 657 | 191 726 | 80.0 | 127 976 | 53.4 |
| **2014** | 236 051 | 191 966 | 81.3 | 127 358 | 54.0 |

Source: DBE (2014)

Any stagnation in learner performance sends shockwaves to stakeholders in education, and raises serious questions to ponder. No doubt any threat to learner performance is especially disconcerting to stakeholders, especially geography teachers, parents and the Department of Basic Education. Although there are studies confirming the decline of academic performance in general (Adeyemi 2009; Innes 2012; Ncanywa 2014; Omoro & Nato 2014), there is a shortage of comprehensive studies on educators' perceptions of the challenges that influence learners' performance in geography, particularly in the Grade 12 final matriculation examination in South Africa.

## Purpose of the Study

There is very little previous research extensively undertaken towards exploring the views of educators with regard to the challenges contributing to the poor performance of Grade 12 geography learners. Therefore this study was commissioned to explore the perceptions and experiences of Grade 12 geography educators regarding learners' academic performance at the uThungulu District schools. The objectives of this research were therefore to: 1) gain an understanding of how teacher qualification influences learner performance in Grade 12; 2) explore the reasons for the poor performance of the Grade 12 geography learners; and 3) explore the challenges that Grade 12 educators were perceived to be experiencing with regard to their academic performance. In essence, this study aims at investigating the contribution of teaching experience, marking experience, qualification, content knowledge and pedagogical content knowledge in learner performance. The findings of this study may shed some light on what educators perceive are the challenges influencing learner performance in Grade 12 geography. This study might be used to improve learners' basic educational levels, and provide support for

Grade 12 learners experiencing poor academic performance, as well as for their educators.

## The Lens of Teacher Education

### *Teachers' Qualifications and Learner Performance*

Educators' characteristics have been identified in both national and international literature as influencing current trends in learner performance. Several studies have suggested that there is a positive relationship between learners' achievements and educators' academic qualifications (Hanushek & Rivkin 2004; Darling-Hammond 2006; Hattie 2009; Hinton & Fischer 2010). Hanushek and Rivkin (2004) posit that learners taught by highly qualified educators perform well, hence are likely to progress faster than those taught by unqualified educators. Darling-Hammond (2006) suggests that high school learners learn more from their educators with higher qualifications in their teaching subjects, especially those with bachelor's and master's degrees. Hattie (2009); Hinton and Fischer (2010) attribute excellent teaching to higher qualifications, and find that an excellent teacher has the ability to teach and has a sound knowledge of the subject, is likely to develop positive relationships with learners, has strong classroom management skills, and works with other members of staff to improve overall school performance.

Some researchers, such as Mji and Makgato (2006), have consistently supported the call for the recruitment of highly qualified educators in South African schools. These authors state that desirable teacher qualities include good subject knowledge, teaching skills and classroom management, sound relationships with learners, dedication, accessibility and hard work. The study conducted by Mji and Makgato (2006) investigated factors associated with high school learners' poor performance in mathematics and physical science in South Africa, and shows that teacher qualifications and quality are crucial in learner performance.

Akinsolu (2010) writing on teachers and learner performance in Nigeria, shows a positive and significant relationship between the quality and quantity of teachers and learner performance in high schools. He found that schools with poor performance lacked qualified teachers. These findings correlate with the work of Adeyemi (2009), which linked excellent teaching skills and other attributes of high quality to teachers' qualifications. He noted,

for example, that a well-qualified geography teacher promotes quality teaching and learning, and the lack thereof leads to a decline in learner performance.

## Educators' Experience and Learner Performance

'Experience is the best teacher', goes the English maxim. Studies have shown that educators' years of teaching experience in certain subjects is a determinant of learners' academic performance. A study conducted in California on teachers' experience and learner performance in mathematics by Darling-Hammond (2006) revealed that learners taught by experienced educators performed better than those under novice educators. Darling-Hammond's study concurred with an earlier study done by Rivkin, Hanushek and Kain (2005) in Texas. These authors concluded that less experienced teachers perform significantly worse than more experienced ones.

In South Africa, Bhorat and Oosthuizen (2006) investigated factors that determine the Grade 12 pass rate in the public school system. The result indicated that educators' teaching experience was predictive of Grade 12 performance in the NSC examination. A study on the state of the Eastern Cape schools revealed a positive relationship between educator experience and learner performance (Ncanywa 2014). 'Educator experience was found to be positive and significant in all specifications, indicating a strong positive effect on learner performance' (Ncanywa 2014:13).

## Teaching Methodology and Learner Performance

The training and qualification of educators is to equip them with knowledge and skills to enable them to handle the task of imparting that knowledge and those skills (Ganyaupfu 2013). It is the educators' duty to acquire the learning resources and teaching ability to deliver knowledge to learners. According to Innes (2012:6), 'what makes methodology very important in teaching geography is that the methods required for spatial development are quite different from the content'.

According to Omoro and Nato (2014), teaching methods refer to a broad range of teaching styles, approaches, strategies and procedures used by educators to facilitate learning. The appropriate choice of strategy for a particular lesson is a determinant of a successful or unsuccessful lesson.

According to these authors, there are various strategies available to an educator to choose from and adapt for a lesson, especially a geography lesson: for example, a lecture discussion, demonstration, project or field trip (Adeyemi 2008; Weeden 2011; Omoro & Nato 2014). Akintade (2011) and Ganyaupfu (2013) state that the choice of an appropriate strategy depends greatly on the quality of the educator, in that a good teacher will always make the right choices and produce good teaching results. The appropriateness of the method used to deliver a particular lesson makes a difference. Akintade (2011) blames the poor performance of learners on poor delivery of lessons by educators using inappropriate strategies. According to Omoro and Nato (2014), teaching is an art which must be done methodically, and when an educator teaches with inaccurate planning, she or he does nothing but recite from the textbook, and rote learning takes place. The lesson delivery from introduction to conclusion should be well planned.

## Research Design and Methodology

This article is based on the mixed method approach, which included 50 Grade 12 geography educators teaching in the uThungulu District. A total of 40 educators participated in the survey, while 10 took part in the semi-structured interview schedule. Participants completed the questionnaire on their perceptions of what influences learner performance in geography in the NSC. Convenience sampling was used to select the schools offering geography from the list of schools in the district. The selection of respondents was done through multiple stage sampling. First, the district was subdivided into clusters of 10 using the existing clusters, and simple random sampling was employed to select five respondents from each cluster. The researchers made use of three different data collection instruments, namely: inventory, questionnaire and semi-structured interview schedules. The inventory was used to collect results in geography in the NSC in the six years from 2009 to 2014. The questionnaire was structured to address the issues of respondents' biodata and perception of educators on what factors influence learner performance in the NSC Grade 12 examination. The interview schedule was used to augment the questionnaire (Creswell 2008). The content of the questionnaire included issues to do with teaching experience, marking experience, knowledge of pedagogical method, and

content knowledge which might influence learner performance in geography in the Grade 12 NSC examination.

Participation in this study was voluntary. Educators who chose to participate submitted their responses personally to their SMT member. All participants were given pseudonyms to protect their identities as ethical research practices as espoused by Maree (2016) were observed in this study. All submissions were completely anonymous so that educators could be honest about their experiences of learner performance in geography without feeling that their answers would affect their work in any way.

The duration of the semi-structured interview was between one to two hours. Semi-structured interviews were used rather than structured interviews as they allowed the participants a platform to guide, and where there was a need for probing, the researcher would be able to steer the interview towards the desired end. Again, semi-structured questions were used to stimulate the session and ensure that all topics were covered, such as participants' backgrounds and experiences, as well as their thoughts and feelings about the challenges that their Grade 12 learners were experiencing.

## Data Analysis and Results

The quantitative data were analysed statistically, using the Statistical Package for the Social Sciences (SPSS), while thematic analysis was used to analyse qualitative data. Descriptive statistics such as means, percentages and standard deviation were used in the data analysis. Relationships were established between the dependent and independent variables by means of inferential statistics. Depending on the distribution of the data, the t-test and analysis of variance (ANOVA) were used to specify the relationships between the variables. A 95% confidence level with p-value smaller than, or equal to, 0.05 was used for statistical significance. The qualitative data were transcribed verbatim and the steps followed in order to analyse the data were as follows: coding and grouping similar codes into categories, and then the grouping of the categories into patterns or themes.

To ensure trustworthiness, the 10 geography teachers who participated in semi-structured interviews were required to write personal reflective journals to identify any possible biases that they might have had about Grade 12 geography learner performance. In order to enhance the dependability of data,

the researcher had to use the services of external auditors (senior researchers), who arranged for peer debriefing after each focus group, and certainly questioned their interpretation of the data after their coding and thematic analysis. In order to enhance credibility, member checking was also conducted by the researchers with all participants after the thematic analysis was completed to ensure that the information was understood correctly by the researcher.

## Findings

This section presents findings generated from the survey and semi-structured interviews with Grade 12 educators who participated in this study. Grade 12 geography educators were able to share their views about what could be the challenges facing learners' performance in Grade 12. The triangulation of data is an integrated approach that brings both the quantitative and qualitative instruments together (Cresswell & Clark 2007). The results of this study are presented in two folds. The first section presents the analysis of data collected from the respondents on factors influencing learner performance using the questionnaires and interviews. The analyses were presented as descriptive and inferential statistics which were represented as tables, graphs, percentages, means, and significant tests to determine an association between the variables. The qualitative data were integrated into analysis in order to ensure that verbatim quotations, i.e. the participants' voices, were there to deepen understanding of why learners' performance has been what it has been in recent years.

## Educators' Qualifications and Learner Performance

The result from the analysis of collected data on teachers' qualifications shows that most educators (72.5%) in the sample were qualified. However, this figure falls below the average national norm of 97% and the average provincial norm of 92% (Stats SA 2014). In KwaZulu-Natal, the average norm of 92% has been described as the lowest in the country (DBE 2012), and the province has been struggling to recruit qualified educators (Stats SA 2014). The result confirmed that there is a significant number of educators in the uThungulu District who do not meet the Minimum Requirements of Teacher Education Qualifications

Policy of 2007. The policy requires that all educators should be in possession of a BEd degree or appropriate first degree with teaching diploma (PGCE), or a diploma (NPDE, for example).

**Table 2 ANOVA performed on educator qualification and learner performance**

| | Sum of Squares | Df | Mean Square | F | Sig. |
|---|---|---|---|---|---|
| Between Groups | 17.873 | 5 | 3.575 | 1.694 | .163 |
| Within Groups | 71.727 | 34 | 2.110 | | |
| Total | 89.600 | 39 | | | |

However, it is evident that educators' qualifications are not significant in learners' performance in geography in the uThungulu District schools. This was confirmed by the ANOVA test in Table 2, which shows that the relationship between educators' qualifications and learner performance is insignificant. The ANOVA calculation of F = 1.694, sig = .163 (P > 0.05) suggests that there is no relationship between the qualifications of educators and learner performance in geography in the matric examination. This finding indicates that an educator's high qualification does not necessary lead to more learners passing their final examination in geography. It could also mean that the highest qualifications were obtained in other fields, not necessarily in geography. Participant 1 argued that,

> *because I know I am not 100% qualified, I have to do a lot of reading and research before meeting my learners. This has helped me over the years to acquire the experience to teach and to make a meaningful impact on my learners.*

One educator with an MEd degree in geography has been teaching Grade 12 with less qualified educators with only junior degrees. This case was very interesting because this highly qualified educator conceded that qualification does not yield good performance in the NSC. Participant 9 showed me a teacher who has recently graduated with an NPDE who is a shining example with regard to learner performance in Grade 12.

> *This teacher is less qualified, but his Grade 12 results have been outstanding. Every year he receive awards for being the best teacher in the district. I have decided to learn from his successful teaching approach to geography.*

This view was consistent with that of Participant 4, who stated that teaching is a funny profession: some teachers are born teachers, while others are a disgrace to the profession irrespective of their qualifications. In the previous years, he alleges, they used to have a geography teacher who was very promising, but his work with geography students was dismal. Students would fail geography under his watch, and he would blame learners for their poor performance. The participants felt strongly that an educators' qualifications had a big impact on learner performance, but they could not be the only factor.

More importantly, the educators' subject content and pedagogical knowledge might affect the results since the universities they had attended were not considered. This was because each educator had received different training from different institutions. As mentioned earlier by one of the participants, it may be that educators with lower qualifications put more effort into learning the lesson content before teaching, and acquire their knowledge through this effort, even if they are not certificated. This suggests that teaching can be done through experience rather than academic qualification. Another possible reason for this finding's being inconsistent with the findings of earlier researchers is probably the subject specificity of this research.

## Educators' Teaching Experience and Learner Performance

Educators with more than five years of continuous teaching are considered to be experienced (Akinsolu 2010). The results reveal that most of the geography educators at the sampled schools had considerable teaching experience in geography Grade 12. 72% of the educators had more than five years' teaching experience, leaving 28% with less than five years' experience. It emerged from the analysis that educators from the high-performing schools were found to have considerable teaching experience, and had been teaching consistently in their schools, whereas the low-performing schools were found to have educators with the least teaching experience and a high turnover in geography educators. These teachers have very little chance of being given another chance

to teach geography at the matric level pending the outcomes of matric results. Hence, educator experience was found to be associated with learner performance in geography.

**Table 3: ANOVA table for educator experience and Learner performance**

| | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|
| Between Groups | 37.992 | 4 | 9.498 | 6.441 | .001 |
| Within Groups | 51.608 | 35 | 1.475 | | |
| Total | 89.600 | 39 | | | |

A statistical analysis of the data as shown in Table 3 revealed a significant relationship between educators' years of teaching experience and learner performance in geography in the NSC examination in the uThungulu District: $F(1, 39) = 6.441$; $sig(p) = 0.001$; $p < 0.05$. This result confirms that the number of years educators had taught influenced learners' academic performance in geography in the NSC examinations. It is conclusive that the more experienced the educator, the better he/she can handle the classroom and teaching dynamics to achieve results (Ncanywa 2014).

Notwithstanding the above conclusions, a study carried out by Glewwe *et al*. (2011) found a weak relationship between teaching experience and learner performance. Using meta-analysis, the authors concluded that there is a weak relationship between educators' teaching experience and learner performance in mathematics. Participant 7 concurred with this finding.

> *This is my second year in this school teaching geography in Grade 12. I am not used to my learners since I spend a lot of time trying to control the class because learners are not used to me either. The little time spent on teaching and learning is my biggest problem with teaching in this school. I also have to spend considerable time familiarising myself with departmental policies instead of preparing to teach.*

The more experienced educators do not seem to deal with non-academic issues, but instead they use their experience to cover the curriculum content. In other words, they are always efficient with time and curriculum implementation to

maximise the chance of learner performance in Grade 12. Participant 5 was very confident about his experience and performance in geography:

> *As for me, to be frank with you I have no problem as far as geography is concerned. I have been teaching this subject for over 10 years, and have been producing a good matric pass rate. Though initially I had some challenges with GIS, I overcame them through the help of an in-service course. In fact, geography is part of me now: I eat geography, drink it and it is me...hahahaha!*

Educators' teaching experience has proven beyond doubt to be a powerful tool for classroom management and delivery of lessons. The evidence from this study is that the educators' experience should be coupled with consistency, with fewer turnovers; an educator should spend more years in one school teaching the same subject. Following the English axiom 'experience is the best teacher', school management should deploy the experienced educators in the Grade 12 classes.

## Educators' Marking Experience and Learner Performance

Tied to educators' teaching experience is their marking experience and its influence on learner performance in geography in the NSC examination in public schools in the uThungulu District.

**Table 4: T-test performed on educator marking experience and learner performance**

| | **Levene's Test for Equality of Variances** | | **t-test for Equality of Means** | | |
|---|---|---|---|---|---|
| | F | Sig | T | Df | Sig (2-tailled) |
| Matric results Equal variances assumed | 19.671 | 0.000 | 3.031 | 38 | 0.004 |
| Equal variances not assumed | | | 2.460 | 15.877 | 0.026 |

Significant differences were observed in Table 4 with respect to educators with marking experience and the matric pass rate in their schools. It is expected that educators with marking experience tend to have the experience and ability to teach learners to answer final examination questions. Levene's Test for equality of variance shows F= 19.671, sig (p value) =.000. The p value is considerably smaller than 0.05, indicating variance not equal. From the test of equality t= 13.500, df = 38, p (2-tailled) = 0.000 ($p<0.0005$). The result is significant, and therefore there is a significant difference in the matric pass rate in relation to educators' marking experience. This finding shows that learners taught by educators with marking experience perform better than those who are taught by inexperienced markers. Marking experience contributes greatly to educator competence in understanding what to teach and how to package curriculum content in line with assessment of learners, since this competence is rare and contributes greatly to learner ability to answer higher order questions that have always been the problem with most learners.

The results presented in Table 4 proved significant as many participants agree with this finding. Almost all the participants who have participated in the NSC marking examination underscore the importance of experience as they prepare learners for final examination. They strongly believe it helps them to better prepare continuous assessment during the course of the year for their geography learners. The idea of knowing how certain topics or sections are examined is enough for these educators to focus on those specific aspects usually targeted by examiners. Linked to this is the issue of how these questions are supposed to be answered, which gives educators' confidence to learners. Participants 1, 4 and 8 were thankful to be part of this experience, and they believe the entire teaching experience will never be the same after participating in the NSC marking of the Grade 12 examination. Participant 1 stated:

> *I participated in the marking of Grade 12 examination question papers in 2009. That experience changed my life as a geography educator. It is unfortunate that not all teachers can take part in this significant process. Participating in marking is likely to change the way one looks at the teaching philosophy of geography, and your expectation as you assess your learners.*

Some of the participants recounted the experiences they shared with other geo-

graphy educators in marking centres every year. The other participants painted a very interesting picture about the credibility of these marking centres, and this is what Participant 4 said:

> *The majority of these educators who always get invited to mark Grade 12 examination question papers appreciate the opportunity, and they always count their blessings during the gathering. One gets to learn the thinking behind some of the high order questions, and what the examiners expect from us educators and learners.*

The fact that educators learn a great deal of examination technique which they are prepared to share with their learners proves it is worthwhile to be invited to mark in these centres. These centres act as learning platforms of excellence for the few selected teachers. The credibility of these centres is evident when one of the participants brags about how fortunate he has been to be part of the marking process for Grade 12 geography. Participant 8 alluded to this, with the following remark:

> *I got invited to mark for Grade 12 eight years ago, and all the markers indicated to me that marking centres are reliable spaces for learning. But not just learning to deliver the content, in fact learning to package information for your learners as you prepare them for examination. These techniques are reliable and credible as they give us confidence to teach geography with pride.*

The conclusions one draws from these interviews is consistent with findings from the t-test in Table 3. Almost all teachers who participated in the 12 NCS Grade 12 examination marking had an advantage over those who did not. In contrast, certain educators will always remain in the dark about what to expect during the final NSC Grade 12 examinations because they are deprived of this golden opportunity to mark in these national examinations. It is a sad reality that the South African Department of Basic Education cannot select all educators to take part in the marking of geography Grade 12 examinations. Those educators who have been teaching Grade 12 for some time are aware of the kind of struggle one has to endure when the performance is not forthcoming.

## Educators' Subject Content Knowledge and Learner Performance

Geography content is packaged to cover human and physical geography; the latter is scientifically driven. The natural science aspect is challenging, but the idea that teaching GIS is challenging was consistent across the entire participants' divide. In reality, most educators believe that the introduction of GIS into the curriculum should have been done in consultation with schools. This was evident from Participant 5 when he gave the following narrative:

> *I don't like teaching mapwork because of the calculations and the GIS section. I like the map interpretations very much, but as for GIS and those calculations, forget it. My counterpart, who teaches Grade 10, doesn't know it either, therefore we are all struggling to teach this section and it's an embarrassment, I know. Eish! It is a big challenge.*

The other respondents shared similar sentiments about the teaching of GIS in their respective schools. The fact that GIS is not properly taught remains a serious concern for most of these participants. It was clear that teachers are embarrassed to teach GIS to their learners, as was echoed by Participant 7:

> *GIS is new to me, but I know it is a computer course that must be taught to learners. In our schooldays we did not do GIS, and therefore this is entirely new to me. I must be honest with you – I don't teach it. The only thing I do is to copy what is in the textbooks for learners. There was a time I invited another educator who came and helped me.*

Educators expressed their dislike for the teaching of mapwork and climatology because of the lack of resources in their schools. There are certain topics in mapwork that cannot be taught without topographical maps, drawing instruments and computers, all or most of which were found to be absent in some schools. The topics on GIS were problematic to all but a few (12.5%) of the respondents. The result shows that learners in these schools would have problems with mapwork in their final year examination. Beside GIS, geography content presents problems for these participants, although they have been teaching it for years. Most educators' lack of mathematical skills contributes towards the poor teaching of mapwork, GIS and climatology. In

essence, educators with low confidence in handling critical mathematical operations and other technical skills has a bad effect on preparing learners for Grade 12 examinations. This finding is even more compelling when you realise that educators perceive the poor teaching of mathematics in their schools. This challenge is not limited to the uThungulu District schools as the general performance of geography content and mapwork in the NSC examination nationwide has been described as problematic in all schools (DBE 2014). The never ending reorganisation of curriculum content for Grade 12 poses a serious challenge for educators, let alone the learners. In some instances these learners are not properly guided to deal with complex examination questions that can maximise their chances to do well in their final examination.

## Pedagogical Content Knowledge and Learner Performance

The primary purpose of any teaching is to bring a fundamental change in the learner (Tebabal & Kahssay 2011). Knowing how to teach includes the interpretation of the subject content and ways to transmit the knowledge to learners so that they will understand it. The first step in teaching is to understand what is to be taught and how it should be taught. The four most popular teaching methods – lecture, group discussion, question and answer and demonstration – were employed one way or the other by each respondent in the delivery of geography lessons in the classroom. Studies have found that there is a relationship between teaching methodology and learners' performance in geography (Akinsolu 2010; Innes 2012; Omoro & Nato 2014). Participant 6 reflected on the use of the discussion method when teaching physical and human geography. His detailed account of using this method shows the amount of trust and confidence he has in this method. He claimed that learners respond positively to his teaching style and approaches if the lesson is centred on discussion:

> *I use a particular method for a particular topic under discussion. For example, when I want to teach mapwork the demonstration approach is the most appropriate because the learners must practise what is taught. You can't use, for instance, the lecture method, which is just giving information to learners. But when teaching a topic like fluvial processes, where learners must*

> *visualise, you can use the lecture method because you are exposing learners to some fact they are not aware of.*

However, three of the methodologies (lecture, question and answer, and group discussion) were found to be detrimental to learners' performance because they stifled learners' creativity and critical thinking (Adeyemi 2008). This means that the three methods are harmful to learners' performance, and should not be used too much in the delivery of geography lessons. This concern was echoed by Participants 2 and 3, as they were convinced that a lack of guidance and pedagogical skills sometimes lead to unintended use of these three methodologies. The absence of resources in schools for most of the participants directly influenced their choice of teaching methods and other related approaches. They agreed that:

> *Sometimes they are forced by circumstances and lack of resources to use the wrong methods. In my case, I know that using demonstration will be good for teaching mapwork, but we don't have enough maps in the schools, and therefore I prefer to use chalkboard instead of getting learners to practise.*

Some educators used certain teaching methods as a means to solve classroom management challenges. This was evident from the number of participants who spoke of the constant frustration they are experiencing in their classes. The choice to use unpopular teaching methods arises from the calibre of learners they have in a given year. In reality, there are times when you are fortunate to teach a group of learners with integrity, while in other years you deal with hooligans who are not prepared to pass at the end of the year. Participant 7 captured this situation well in his response to the question of how they choose teaching methods for teaching geography.

> *There are times when you feel the lesson must be taught using question and answer, but the class is so noisy that you can't use it; but when you begin to write on the chalkboard for them they become less noisy, and copy from the chalkboard.*

There is a school of thought that seems to suggest that schools should do more to expose learners to real environments as an alternative method of

teaching. This idea sounds excellent, but educators have come to realise the power of education authorities in dealing with issues of fieldtrips and authentic learning, as depicted in the words of Participant 10:

> *Learners understand geography better when they see natural phenomena occurring physically, but we have to raise funds to undertake any fieldtrips. I have proposed trips many times, but funds were not available to support this activity in our school.*

Instead, the methods should be used to complement each other in teaching content, i.e. none should be used too much in isolation (Innes 2012). These results are consistent with the finding by Ganyaupfu (2013), which reveals that combining both teacher-centred and student-centred teaching methods in teaching learners is the approach that produces the best results. Geography educators need to take into cognisance that outdoor experience for learners can improve learners' ability to develop insight into the most complex processes that underpin the subject. Examiners always want this complex understanding in learners and for most schools in the province, field trips are a waste of time and resources for the school. Teachers have to rely on show and tell all the time, and are forced to neglect some of the tried and tested methodologies. In recent times, school geography has become one of the less valued subjects in the curriculum because teachers are not allowed to explore geographical knowledge.

## Conclusion and Recommendations

Significant progress has been made with regard to the improvement of quality education across the entire educational spectrum. Nevertheless, the quality of geography education is still far from satisfactory for most learners in the uThungulu District. This study set out to discover and assess the trends in learner performance in geography in the uThungulu District for the period 2009 to 2014, and the factors that influenced them, and has highlighted the most significant predictors of geography performance within the uThungulu District. According to the available data, a number of issues arise, and suggestions have been made for the improvement of education in general, and the teaching and learning of geography in particular. Apart from equity and

access, which have improved significantly in the district and nationally, quality can also be improved by looking at educators' attributes such as qualifications and professionalism, school management and curriculum policies, especially those of the non-performing educators. If these challenges are addressed, the quality of education and performance in geography within the district will be significantly improved.

The following recommendations are based on the findings from this study. Educators' qualifications were identified to be a strong predictor of learner performance in geography in the uThungulu District. Quite a number of educators in the district are still without the departmental requirement to teach. The recommendation is that educators must be given study leave with pay to go and upgrade their academic qualifications. Teaching and studying simultaneously has been very challenging tor most of them, especially those in the rural areas, who have to wake up in the early hours of the day, and return only at dusk.

In the case of the older geography educators in the district, strengthening their knowledge of mapwork skills, especially GIS, should be prioritised by the subject specialists through in-service programmes. Likewise, the newly deployed educators should be strengthened in their pedagogical knowledge. The researcher recommends establishing professional peer-reviewing centres to teach and improve mapwork knowledge among geography educators.

Educators obtaining consistently good matric pass rates must be retained for a significant period of time. The most experienced and dedicated educators are leaving their schools to go to the well-endowed schools, and others are taking early retirement to have access to their retirement annuities. This clearly shows a lack of motivation among experienced educators. There is a need for the Department of Basic Education to motivate these educators through long-service awards that will put some cash in their pockets. This will also motivate the younger ones to aspire to the same height.

Since marking of the final NSC examination has been found to have contributed significantly to learner performance, the involvement in it of all educators will go a long way to improve both teaching and learning in the classrooms. The marking experience will enable educators to be precise in their teaching as they know what will be expected of the learners in their matric examination. Being paid for participating in the marking will further motivate educators to take part. How about also allowing them to take turns? Those who

marked the previous year must not be allowed to do so the following year unless there is a shortage, so that others can learn too

This study has highlighted a number of factors that influence learning, teaching and learner performance in geography in the final NSC examination in selected public schools in the uThungulu District. However, other relevant aspects were not attended to during data collection, and need further investigation. A more comprehensive investigation involving respondents such as learners, school management and parents is encouraged. Also recommended is a rigorous large-scale evaluation using a more controlled experiment in determining the range of factors that influence the teaching and learning of geography. This research is necessarily limited by lack of time, funds, and data from learners, school management and parents, among others.

Significant progress has been made with regard to the improvement of quality education across the entire educational spectrum. Nevertheless, the quality of geography learner performance is still far from satisfactory for most learners in the uThungulu District. According to the available data, a number of issues arise, and suggestions have been made for the improvement of education in general, and the teaching and learning of geography in particular. Apart from equality and access, which have improved significantly in the district and nationally, quality of performance can also be improved by looking at educators' attributes such as teaching experience, marking experience, qualifications, content knowledge and pedagogical content knowledge, particularly of those teaching Grade 12.

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# Implications of the Articulation Gap between Geography Learners in Secondary Schools and University

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## Abstract

There is a concern in South Africa that most learners arrive at university underprepared. This is also a major concern for students who enroll for the BEd programme specialising in geography education. Due to the learners' articulation gap, they are unable to cope with the standard that is expected of them. Hence this study investigated the level of geography learners' preparedness when they arrive at university. The aim of the study was to investigate the challenges experienced by geography students in their first-year of study. The researchers used a qualitative approach grounded in phenomenology as the research design. Purposive sampling was used to select students who failed geography education in both semesters in their first-year of study, the academic year 2016. Two lecturers who teach geography in the first-year were sampled. The geography curriculum used in the secondary schools and university were also reviewed to determine the extent of alignment between the two. A thematic approach was used to analyse the data. The results of the study revealed that geography students enter university without proper preparation, and are therefore unable to cope with their first-year of study. The study further revealed that teachers who teach geography in secondary school are not sufficiently trained to teach geography, which results in their engaging in surface learning as opposed to deep learning. The study recommends that there be collaboration between secondary schools and universities to discuss the university's expectations with regard to learner preparedness. Moreover, geography teachers should be trained on an on-going basis in order for them to keep up with current trends in the area of geography education.


Print ISSN 1023-1757; Electronic ISSN: 2519-5476; DOI https://doi.org/10.29086/2519-5476/2018/sp21a5

**Keywords:** Geography education, teaching strategy, deep learning, disadvantaged schools.

## Background and Introduction

Geography education is the study of the Earth, its natural and physical environments, human activities and social changes. It also involves the study of how these elements interact and the resulting effects, from a local to a global scale. Among the many skills involved are the use of mapping and fieldwork. When taught well geography makes a fundamental contribution to the education of young people, promoting the development of citizenship. Ensuring the quality of geography education is consequently of great significance to policy makers and education leaders, both here and internationally (Jucu 2012: 11). Teachers in the secondary schools of Mankweng Circuit appear to be experiencing challenges when it comes to teaching geography and preparing students for tertiary education. There is poor alignment between the teaching of geography in the basic education phase and at the level of higher education, which results in a wide articulation gap among students who attempt to cope with tertiary education.

Researchers such as Wilton (2012: 19) and Sidiropoulos (2016: 10) have conducted studies on the teaching of geography and the difficulties experienced by teachers in the basic education phase in South Africa, while Spaull (2016: 14) and Heywood (2000: 13) have investigated geography teaching in higher education. The curriculum used in South African schools is prescribed by the Department of Basic Education. However, at the higher education level, each university in South Africa decides what they want to include in their curriculum. Researchers such as Blonde (2014: 18) argue that the content of the curriculum in the universities may affect the quality of teachers they produce and ultimately the quality of education in South Africa. In this study, the researchers observed that some of the universities design their Geography curriculum without consulting either the school curriculum or geography teachers in the basic education system. The literature shows that there is a disjunction between basic education and the universities. We refer to this disjunction as an articulation gap, which comes about as a result of poor alignment and the lack of a working relationship between education at school and university level. Jucu (2012: 17) argues that universities that participate in

teacher training are supposed to adopt the basic education curriculum to ensure consistency and alignment between the two. In geography teaching in higher education, the baseline understanding of the student is fundamental to their achieving a pass mark.

The foundational understanding of geography lies with the learners, what they bring to the class, how they respond to information and what they gain from their learning. Other dimensions of effective learning focus on the 'how' in translating the findings and understandings from research about learners into effective teaching, curriculum, resources and pedagogy (Psifidou 2009: 11). It appears that those who teach geography in primary and secondary schools and in further and higher education need to be supported by research intelligence in at least six priority areas, in order to:

- Clarify the purposes and goals of geography education, no matter how the geography curriculum is expressed locally;
- Refine curriculum, pedagogic and assessment practices used in the teaching and learning of geography;
- Deepen collective understanding of learning progressions in geography;
- Improve ways in which high quality materials and resources for geography teaching and learning can be developed and provided;
- Develop understanding of learners' geographical knowledge and experience, including their misconceptions, to enhance the teaching and learning of geography;
- Improve the teacher education of geography educators, linking innovative teaching practices to empirical research in geography education (Martins 2012: 13).

Reflecting on these priority areas, teachers should consider the kind of learners they have in the classroom. Learners include all the children, youth and adults engaged in learning in formal institutions and informal settings. This dimension of research in geography education concerns such aspects as how learners gain and develop their geographical experiences and their understanding of geography during their lives from their earliest years (McLafferty 2007: 16). It

can be influenced by theories of learning. It encompasses learning informally and in educational settings, learners' motivations, their knowledge and misunderstandings, and their views about their experiences of geography education.

## Teaching Styles in Geography

The term 'teaching style' is used to characterise the way in which geography is taught. Clearly this has an important influence on the educational experience of pupils in geography because it affects how they learn geography. In the context of this study, the way students were taught at school affected their learning in the institution of higher learning they were attending. Researchers such as Swanson (2013: 13) argue that a teacher's teaching style is determined by their 'behaviour' (their demeanour and the way in which they relate to pupils) and the strategy that they choose in order to bring about the intended learning outcomes. Some teachers feel that certain teaching styles and strategies are more appropriate for them because they suit their personality and reflect their philosophy of teaching. In the context of basic education, teachers are often compelled to engage in surface learning because learners are unable to engage critically with the syllabus. However, it is now generally accepted that teachers need to develop a repertoire of different styles and strategies (Meristo & Eistenschmidt 2014: 18). The reason for this is because they need to consider the characteristics and needs of their pupils (their attitudes, abilities and preferred ways of learning) and the intended learning outcomes, as well as their own preferred ways of teaching.

Mashele (2016: 10) is of the view that geography teachers draw upon their own body of pedagogic knowledge about how they teach and how pupils learn. Teachers' personal qualities and their approach to classroom management influence the way that they teach. In the context of higher education, the nature of the learning environment that lecturers work in (classroom appearance and layout), the size of the class and the availability of appropriate learning resources also have a significant influence on the decisions that they make about their teaching (Pichana 2017: 14). Johnson (2017: 11) is also of the view that many of the terms that are used to describe different ways of teaching are not always helpful. Mutshaeni (2015) agrees that terms such as didactic, teacher-directed, whole-class, practical and experiential provide what are at best only general descriptions. When used to describe

teaching styles, terms such as 'progressive' and 'traditional' are value-laden and stereotypical extremes. For example, one might assume that 'progressive' teaching is necessarily enquiry-based, child-centred, concerned with problem-solving, and therefore represents a forward-looking and effective approach to teaching geography.

Traditional teaching may be seen as being old-fashioned, autocratic, didactic and lacking creative opportunities, or as being reliable and effective at maintaining academic standards. Opinions about the relative strengths and weaknesses of different styles of teaching vary and such descriptions only give a partial view of how a teacher may be teaching (Harris & Brown 2013: 19).

## The Role of Literacy in Learning Geography

Literacy has a significant role in teaching and learning in higher education. When learners exit basic education to enrol at university they are expected to move from surface learning to deep learning (Johnson 2017: 17). In higher education more space is created for criticality, reflection and praxis. That means that students should be able to think critically, reflect on the topic taught and what it means to them, and apply what they have learned in class practically. Sikhwari and Malatji (2017: 19) are of the view that problem solving is a critical teaching strategy appropriate in higher education. In the context of geography teaching, deep learning is also necessary in order to produce teachers who are critical. There is a need constantly to encourage learners to be critical during their tertiary education. Researchers such as Mashele (2016:15) argue that most students in South Africa enter universities underprepared. The Blue Paper on Higher Education (2000: 33) recommended that universities should broaden access for students and at the same time support them to cope with their studies. Such a call has resulted in overcrowding in higher education, requiring lecturers to use teaching strategies such as co-operative learning, which demands that students take responsibility for their learning.

This results in an articulation gap, where students who are used to a teacher-centred approach now find themselves in charge of their learning and the need to express their ideas sometimes in a language that is not their mother tongue. As a result they find it difficult to adapt to and cope with learning in higher education.

## How Geography Educators Learn in their Professional Work

Geography educators are generally employed in schools, universities, field study centres and government ministries. These different contexts reflect different work-place settings in which learning on the job is done. In the context of this study, new university students bring with them the knowledge and experience gained from their basic education, which affects the way they learn. Researchers such as Malatji and Wadesango (2014: 5) are of the view that baseline information plays a significant role in how students learn in the higher education context. While the demands on the educators vary there will be a reasonable amount of common ground in the ways that they learn. What is likely to differ among subjects are the types of examples of learning, because they will relate directly to the different professional contexts in which these educators operate.

## Learning through Formal Training

All geography learners will have experienced formal training prior to beginning their university education. However, their experience at school has repercussions on the way they learn. Poor alignment between basic education and higher education results in an articulation gap that affects the way student learn. Basic education teachers are educated and trained to become geography teachers. Many of these educators accept the challenge to upgrade their qualifications by undertaking further formal training, and have received higher university credentials. However, the nature of the learners in schools forces them to approach teaching in a particular way, which may deviate from the way they were trained. Researchers such as Mangena (2017: 9) argue that most of the institutions of higher learning that are involved in teacher training adopt a learner-centred approach as the model for training their teachers. However, this approach has been adopted without consultation with schools in the basic education domain, which results in what we have called the articulation gap.

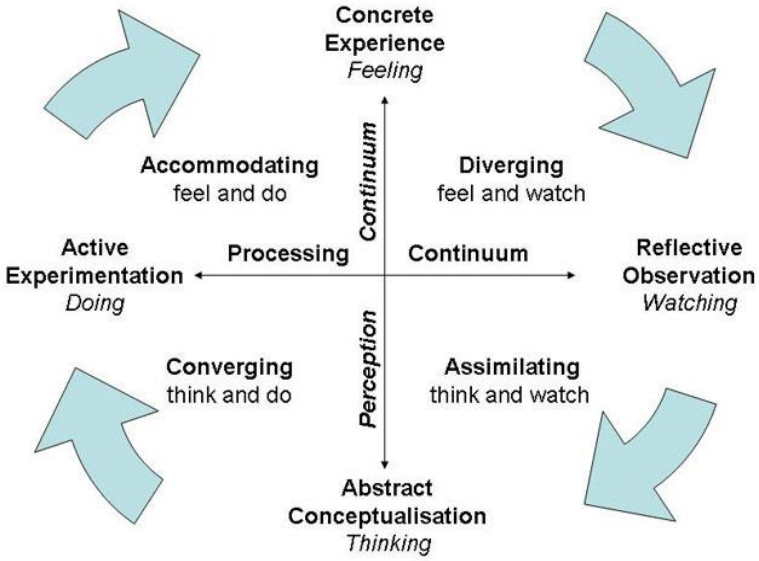
## Brief Description of Kolb's (1974) Learning Style in the Context of Higher Education

Kolb (1974: 4) views learning as an integrated process with each stage being mutually supportive of and feeding into the next stage. It is possible to enter

the cycle at any stage and follow it through its logical sequence. In the context of geography teaching, the common practice is to start with theory before practice. However, effective learning only occurs when a learner is able to execute all stages of the model. Therefore, no one stage of the cycle is an effective learning procedure on its own. Kolb explains that different people naturally prefer a certain single different learning style. In the context of the secondary schools and university under study, there was a clear disjuncture that the university was not addressing, with the result that geography students were failing to cope with their first year of study.

Various factors influence a person's preferred style. For example, social environment, educational experiences, or the basic cognitive structure of the individual. Kolb models these variables in the figure below.

**Figure: Kolb's Learning Style**



Kolb believes that we cannot perform both the variables on a single axis at the same time (e.g. think and feel). Our learning style is a product of choices among these variables. In the context of geography education, teaching and learning is centered on thinking and feeling. Students are encouraged to think critically and give their view on how they feel about certain issues. It is often easier to see the construction of Kolb's learning styles in terms of a two-by-two matrix. Each learning style represents a combination of two preferred styles. The diagram also highlights Kolb's terminology for the four learning styles applicable to geography education: diverging, assimilating, converging, and accommodating.

## Application of Kolb's Theory in the Context of Higher Learning

### *Diverging (Feeling and Watching – CE/RO)*

Students are able to look at things from different perspectives. They are sensitive and they prefer to watch rather than do, tending to gather information and use their imagination to solve problems. They are best at viewing concrete situations from several different viewpoints. Kolb called this style 'diverging' because these people perform better in situations that require idea generation, for example, brainstorming. People with a diverging learning style have broad cultural interests and like to gather information. They are interested in people, tend to be imaginative and emotional, and tend to be strong in the arts. People with the diverging style prefer to work in groups, to listen with an open mind and to receive personal feedback. In the context of higher learning (geography teaching in particular), some of the active teaching strategies are small group teaching, cooperative learning and whole class discussion. Such strategies allow students to observe the learning process and give their input on how they feel and understand issues. In some disciplines students are taken on fieldwork outings for observation. Such practices as presented by Kolb accommodate students' different views and promote learning in a cooperative manner. In the context of this study, learners in the secondary schools of Mankweng Circuit are not exposed to field trips where they can relate to what they have learned in class, which creates problems when they join university in their first year of study.

## *Assimilating (Watching and Thinking – AC/RO)*

The assimilating learning preference is for a concise, logical approach. Ideas and concepts are more important than people. These people require good, clear explanations rather than practical opportunities. In the context of geography education, students should be introduced to some key concepts that will assist them to cope with their first year of study at university. Introducing students to key concepts would ultimately assist them to excel at understanding wide-ranging information and organising it in a clear logical format. People with an assimilating learning style are less focused on people and more interested in ideas and abstract concepts. People with this style are more attracted to logically sound theories than approaches based on practical value. This learning style is important for effectiveness in geography education. In the institution of higher learning, students with this learning style prefer reading, lectures, exploring analytical models, and having time to think things through.

## *Converging (Doing and Thinking – AC/AE)*

People with a converging learning style can solve problems and will use their learning to find solutions to practical issues. They prefer technical tasks, and are less concerned with people and interpersonal aspects. People with a converging learning style are best at finding practical uses for ideas and theories. They can solve problems and make decisions by finding solutions to questions and problems. In the context of the institution of higher learning, research is one of the core businesses of the university. As proposed by Kolb, researching and finding solutions to existing problems is important for geography education. People with a converging learning style are more attracted to technical tasks and problems than social or interpersonal issues. A converging learning style enables specialist and technology abilities. People with a converging style like to experiment with new ideas, to simulate, and to work with practical applications.

## *Accommodating (Doing and Feeling – CE/AE)*

The accommodating learning style is ‘hands-on’ and relies on intuition rather than logic. These people use other people’s analysis, and prefer to take a practical, experiential approach. They are attracted to new challenges and experiences, and to carrying out plans. They commonly act on ‘gut instinct’

rather than logical analysis. People with an accommodating learning style tend to rely on others for information rather than carry out their own analysis. This learning style is prevalent within the general population. In the context of higher learning, the existing theories and literatures are discussed and scrutinised in order to come up with new theories. This kind of learning style requires people who think critically and are able to analyse. Therefore, accommodating learning styles become very important for teaching and learning to take place in geography education.

## Methodology

The research approach adopted for this study was qualitative. The purpose of qualitative research is to develop an understanding of individuals and events in their natural state, taking into account the relevant context (Leedy 2001: 6). Qualitative research is aimed at gaining a deep understanding of a specific organisation or event, rather than a surface description of a large sample of a population. It aims to provide an explicit rendering of the structure, order, and broad patterns found among a group of participants. In qualitative research, the interpretation of data is achieved by means of set criteria in order to determine the depth or quality of the understanding of findings (Leedy 2001: 33). Procedures are not strictly formalised, the scope is more likely to be undefined, and a more philosophical mode is adopted (De Vos, Strydom & Delport 2013: 23). The data was gathered through the investigation of small groups. The participants consisted of first-year geography students who failed Geography in the 2016 academic year, grade 12 geography students, and lecturers teaching the first-year geography class.

## Research Design

The research design of this study is phenomenological. Cresswell (2007: 16) regards a phenomenological study as one that describes the meaning of the lived experiences of a phenomenon or concept for several individuals. In the context of this study, the experiences of geography teachers, learners, lecturers and students of the articulation gap between grade 12 and university geography education was investigated in order to determine the implication of this gap for first-year students' learning. The phenomenological approach aims to describe

what the life world consists of, or more specifically, what concepts and structures of experience give form and meaning to it (Scharam 2006: 23). The researchers, using a phenomenological framework, strove to describe the phenomenon as accurately as possible, refraining from assumptions and remaining true to the facts (Thomas 2004: 11).

The present study aimed to understand the implications of the articulation gap between secondary schooling and university geography education for first year-students who intend to major in geography in their teaching qualification. The product of the research is a careful description of the conscious everyday experiences and social actions of subjects. Everyday experience, in this study, refers to actual secondary or university experiences in studying geography. In order to accomplish this, the researchers must extract meaning by making sense of the data provided. Researchers should also be able to distance themselves from their judgements and preconceptions about the nature and essence of experiences and events in their everyday world (Schram 2006: 16).

## Research Questions

- What is the articulation gap between geography education in secondary schools and university?
- What are the experiences of geography first year students?
- What are the views of lecturers about the preparedness of first year geography students?

## Results

The researchers investigated the articulation gap between geography education in secondary schools and university. Both the secondary school and university curriculum were reviewed to determine the extent of any constructive alignment (Biggs 2000: 11). Geography education students are trained and prepared to become teachers in the subject, so what students learn at university should be aligned with what is taught in schools in order for them to become competent geography teachers. When reviewing both the secondary and university curriculum the following themes emerged:

## *Poor Constructive Alignment between Secondary and University Education*

The geography education curriculum was supposed to be aligned with what is taught in schools in order to make the transition from school to university easier for students. In this study it was found that in some parts of the curriculum there is no connection between the two, and this affected students' learning. In the university curriculum reviewed it was found that a section called Geographical Information Systems (GIS) was not taught well in secondary schools, where it was given only the most basic of introductions (Dube 2012: 08). Kolb (1984: 11) argues that people with a converging learning style can solve problems and use their learning to find solutions to practical issues. In this study student teachers are training to become geography teachers. Therefore, they should be in a position to solve geographical problems and be able to operate effectively as geography teachers, bridging the articulation gap that exists between school and university teaching. Researchers such as Jucu (2012: 13) argue that the issue of surface learning affects learners in schools and ultimately our graduates at universities. Moreover, students encounter some content for the first time. With the academic freedom that universities enjoy, they are able to determine their curriculum content. Poor consultation between universities and secondary schools on curriculum development has resulted in these articulation gaps that affect students' learning.

## *Moving away from Surface Learning to a Deep Learning Approach*

For the entire duration of students' secondary education, they are engaged in surface learning as opposed to deep learning – which, according to Kolb's (1974: 6) theory, is described as the assimilating learning style, in terms of which people consider ideas and concepts as more important. However, when students arrive at university they are expected to move away from surface learning to deep learning. Students in secondary schools are regarded as having no prior knowledge of the subject and are provided with all the information by their teachers, with the result that when they arrive at university and are expected to take ownership of their learning they are unable to do so. Spaull (2016: 12) argues that students of the 21st century should be encouraged to be independent and to take ownership of their learning. The study has revealed

that most of the students lacked the confidence to express their views during lectures and this affected their learning.

### *Moving away from 40% Pass Mark to 50% Pass Mark*

In South Africa, the grading system in secondary schools until 2008 (when the Education minister implemented Outcomes Based Education or OBE curriculum) the pass mark for geography ranged at code 3 (E symbol) which is between 40 - 49% (DBE, 2016). Wilton and Erwin (2015: 12) argues that learners in South African schools are not capacitated to compete internationally due to their pass mark in schools. As articulated in Kolb (1984: 8)'s theory teaching in South Africa is pitched at the assimilating learning style which does not promote critical engagement. When learners join universities they are expected to engage in deep learning and they are also expected to obtain 50% and above in order to pass. The study has revealed that students are unable to cope with such a transition and as a result they fail in their first year of study at university.

## Experiences of Geography First-year Students

When geography first-year students were interviewed they raised several issues indicating how they struggled with their first year of study. Some students mentioned that:

> *At university lecturers are not teaching us the same way we were taught in secondary schools. Our teachers in secondary schools teach us until we understand, while at the university some of the issues we are expected to go out and search by ourselves and make sense of the document*
>
> .

This sort of transition in teaching strategy clearly presents a challenge, especially for first-year students. In this study it was found that most students were still comfortable with the traditional approach that was used in schools. But at university, students are expected to take ownership of their learning, starting from their first year of study. Dube (2012: 16) confirms that students who take ownership of their learning are likely to succeed in their studies.

Geography first-year students struggled to cope with a teaching strategy that affected their performance.

It was also found that some of the curriculum taught at universities does not correspond with what was taught in secondary schools. One student mentioned that:

> *Some of the content taught was new to us. For example the content of Geographical Information System was just new to me because at secondary school we were just given background without being deep into what transpired in GIS.*

Reflecting on this quotation, one can argue that there is no communication between secondary schools and universities when it comes to the development of curriculum (Dube 2012: 12). It is in part this poor communication that opens up an articulation gap which affects students' learning in their first year of study. Wilton (2012: 09) mentions the importance of consultation during curriculum development. There is a need for alignment of curriculum with regard to what is taught in secondary schools and universities when preparing student teachers to become geography teachers. Due to the lack of resources in secondary schools, some of the equipment at the university was unfamiliar to students, who as a result were unable to use it.

## Lecturers' Views on the Preparedness of Geography First-year Students

When lecturers were interviewed to give their views about the level of preparedness of geography students in their first year, they responded with mixed feelings that evinced both frustration and blaming of the system. When students are admitted for the BEd programme they are expected to exit the system at NQF level eight, which includes knowledge demonstration and engagement; knowledge literacy with regard to interrogating multiple sources of knowledge; problem solving and accountability. However, in this study it was found that geography first-year students are unable to operate at this level because of the absence of continuity between school and university. One lecturer mentioned that:

> *These students are not ready to be at the university. Some of the stu-*

> *dents cannot even utter a word in English and as results they are unable to participate in class, write essays or make an argument for that matter.*

Reflecting on above quotation, the issue of language and literacy takes centre stage when it comes to the preparedness of learners for university education (Dube 2012: 09). Sidiropoulos (2016: 17) argues that the subject teacher should also be conscious of language and should introduce students to basic literacy within their discipline. In this study it was found that geography first-year students are not well equipped to cope with university education. It appears that what we have called the articulation gap is simultaneously also an *articulacy in English* gap.

## Conclusion

The study has concluded that there is no alignment between the geography secondary school curriculum and the university curriculum. The study has also concluded that even though learners pass geography well in Matric they still struggle with the first year at university due to the articulation gap between basic education teaching and higher education. The study also concludes that this gap results in challenges when it comes to student's learning. Lecturers in the geography first-year class also experience some challenges when it comes to teaching students at this level, and believe that the problem is also one of language, or an articulacy gap.

## Recommendation

- There should be alignment of the geography high school and university curricula.
- The university should have a literacy course that is aligned to geography education.
- The university should consult with schools about current geography trends in the subject.
- The university and schools should exchange programmes, exchanging geography university lecturers with school teachers to strengthen the collaboration.

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# Bringing Map Learning to 'Life' by Using the Environment as a Learning Resource

**Sarita Ramsaroop**

## Abstract

The last two decades have brought to light local and international research on problems encountered by learners when learning Geography at school, especially map work. One of the reasons provided for poor learner performance relates to teacher expertise in teaching this subject. This research explored how first-year student teachers from a university in Johannesburg, South Africa, merged their coursework with their fieldwork when learning map work; and how they were able to re-imagine their teaching of map skills to learners in the Intermediate Phase of the primary school. In addressing the research aim, a qualitative case study method of inquiry, using open-ended questionnaires, was undertaken. Drawing on the findings from the data, I assert that using Kolb's experiential learning theory, to integrate student teacher learning in coursework and fieldwork, not only strengthened pedagogic content knowledge, but also enabled student teachers to exhibit agency. The data confirmed that student teachers configured their understandings of map work by engaging their past experiences with the present (learning in coursework and fieldwork) to re-orientate their learning towards the future (how they will teach learners). For example, student teachers were empowered to take agentic action by reflecting on their learning in coursework and fieldwork to make informed pedagogical choices on how they would teach this content area to learners in the primary school. Thus, the foundations for learning to teach geographical enquiry skills were being developed.

**Keywords:** fieldwork, student teacher learning, map work, student teacher agency, experiential learning


Print ISSN 1023-1757; Electronic ISSN: 2519-5476; DOI https://doi.org/10.29086/2519-5476/2018/sp21a6

## Background to the Study

The Social Sciences curriculum aims to provide opportunities for learners to make connections to their everyday realities and to develop skills that foster critical thinking to question these everyday realities (DBE 2011). The subject Social Sciences includes the fields of History and Geography. The content area 'geographical skills and techniques' is included in the Curriculum and Assessment Policy Statement (CAPS) in South Africa from Grades 4 - 9 in the field of Geography; and continues into Grades 10 - 12 in the subject Geography (DBE 2011). The geographical skills and techniques that need to be developed are classified into the following categories: map-work skills (such as reading, interpreting and synthesising information from maps); map-work techniques (such as calculating distances and gradients); and geographical enquiry skills (such as following the scientific methods of enquiry) (Umalusi and Higher Education South Africa, 2010). The CAPS curriculum stipulates that learners need to develop mapping skills (DBE 2011:13). In developing the mapping skills of learners in the primary school, the Intermediate Phase Social Sciences Geography curriculum expects learners to understand concepts such as grid referencing; compass direction; reading and drawing maps; and scale (DBE 2011). By introducing learners to these basic map work skills in the Intermediate Phase, the foundations for learning geographical enquiry skills are laid down. Innes (2003:727) asserts that if learners are to become skilled in the use of maps, there needs to be clear progression from basic map reading, to map analysis, to map interpretation.

From the above discussion, it is evident that teacher education programmes need to equip student teachers with the necessary knowledge on 'what' and 'how' to teach map skills to learners in the Intermediate Phase. According to the Department of Higher Education and Training (DHET) policy on MRTEQ (2015:25), all Intermediate Phase student teachers must be equipped with 'sufficient broad background knowledge to understand the requirements of all subjects in the Intermediate Phase curriculum'. The implication is that all student teachers specialising in Intermediate Phase teaching should have sufficient knowledge to teach all subjects, which includes Social Sciences and Geography. However, research over the last two decades has highlighted the problems encountered by learners at school when learning Geography, including map use (Innes 2003; Larangeira & van der Merwe 2016). These difficulties continue into the first-year of university, with many

Geography students still experiencing difficulty with map interpretation (Larangeira & van der Merwe 2016).

Research in South Africa on how student teachers draw on their experiential learning when learning to teach map work skills in the primary schools is limited. This study, therefore, explores how first-year student teachers merge their learning of map work skills during coursework with their learning during fieldwork to re-imagine how they would teach map skills to learners in the Intermediate Phase of the primary school.

## Teaching Map Work in the Primary School

Geography involves the study of people and the earth taking into consideration place, space and environment (Weeden 1997). Investigating spatial patterns and developing locational knowledge is central to the discipline, with maps being a vital tool in explaining such patterns and processes (Brunn & Dodge 2017; Weeden 1997). Maps are therefore essential materials for understanding, analysing and solving problems in Geography pertaining to place, space, and human interaction with the environment (Koc & Demir 2014; Larangeira & van der Merwe 2016; Maxim 1997; Natoli 1988). Therefore, to teach Geography without a map would be very difficult. In South Africa, maps are regarded as the basic tools of Geography for the primary school learner (Beets & Le Grange 2005). I would also add that maps lay the foundation for learners to engage with ICT when learning, for example, Geographical Information Systems (GIS), a compulsory component of Geography CAPS (DoE 2011) in Grades 10 - 12.

Although map-related education takes place mainly within the discipline of Geography, its importance extends beyond the Geography classroom (Koc & Demir 2014; Liben, Kastens & Stevenson 2002). For example, it plays an important role in developing representational and spatial skills in children, as it develops and strengthens their general symbolic and spatial reasoning (Liben, *et al.* 2002). It teaches learners how to navigate by learning how to interpret symbols and how to understand scale. It facilitates an understanding of the 'very nature of representation', which Liben *et al.* (2002:270) explain as an 'understanding that does not come automatically to children'. These scholars further elaborate by explaining that both younger and older children find it confusing to understand that the symbols in maps

represent other objects (Liben *et al.* 2002). Lessons from map learning can be applied to a diverse range of fields such as ecology, geology, civil engineering and urban planning (Liben *et al.* 2002). Drawing from the aforementioned discussion, I would argue that it is imperative that all learners acquire basic map skills.

Unfortunately, learners, both locally and internationally, appear to experience much difficulty in understanding and applying map work concepts (Innes 2002; Larangeira & van der Merwe 2016; Ying 1997; Yoshida 2015). In particular, South African learners have been found to have low levels of map literacy (Innes 2002; 2012). Some of the reasons for the poor performance of learners in map work appear to relate to teachers' pedagogy when teaching map work (Innes 2012; Lloyd & Bunch 2010), specifically their overuse of theory (Ndlwana 1991; Ying 1997). In South Africa, learners reported that the concepts were taught in an abstract manner as they were not taught in ways that enabled them to compare maps to reality using photographs and practical field work (Larangeira & van der Merwe 2016). Teaching map work by making concrete links to reality is necessary as it forms the basis for cartographic communication (Ying 1997). Another reason for the low levels of map literacy could be low levels of teacher expertise in teaching the subject. When Geography and History are integrated in the Social Sciences curriculum, teacher expertise can be questioned since the same teacher is expected to teach both fields of knowledge. Research in Australia has pointed to the compromised quality of Geography teaching stemming from a shortage of suitably qualified Geography teachers when Geography is integrated into the Social Sciences curriculum (Reitano & Harte 2016). Teachers in schools assigned to teach Geography are generalists, with limited Geography knowledge, thus compromising the quality of Geography teaching and learning (Reitano & Harte 2016).

As mentioned, teacher expertise is an area of concern in South Africa too. A report published by the Department of Education (DoE 2007) indicates that many teachers in South Africa still lack the epistemological and pedagogical skills to teach their area of specialisation effectively. Specific to teaching Geography, many teachers in the high school appear to lack the subject or pedagogical knowledge to teach geographical concepts and processes (Beets & Le Grange 2005). In addition, most South African Geography teachers were trained in an era when summative assessment and rote learning were the dominant practices (Beets & Le Grange 2005). This

raises questions pertaining to the pedagogy used to teach Geography in a 21st century classroom.

## Experiential Learning Theory as Pedagogy in Teaching Map Work

It has been asserted that 'geographical inquiry begins with observations of physical features' (Maxim 1997:207). Through direct experience, learners are able to develop mental structures to connect theory and construct meaning. Fieldwork is, therefore, an important interface between teaching and learning as it links the theory to the 'real world' (Day 2012). In defining fieldwork, I refer to the definition as outlined by Scott, Fuller and Gaskin (2006 cited by Day 2012:313), that fieldwork is a 'formal process of study of the environment that takes place outside the classroom and that uses the environment as a learning resource'.

In this study, I make use of Kolb's experiential learning theory (1984) to understand how to merge student experiences with academic content to make learning real and relevant, as I view the interaction of knowledge, skills and experience as key to learning. Kolb (1984:38) asserts that 'learning is the process whereby knowledge is created through the transformation of experience'. I believe that it is through personal experiences that theory takes on meaning and fosters growth and critical thinking (Dewey 1933). At the core of Kolb's four-stage model, immediate concrete experience forms the basis of observation and reflection (Kolb 1984). Kolb refers to these four stages as concrete experience abilities (CE), reflective observation abilities (RO), abstract conceptualisation abilities (AC), and active experimentation (AE). These different stages incorporate different learning styles, giving credence to the notion that individuals have preferred learning styles (Kolb 1984). Healey and Jenkins (2000) assert that the theory offers a way of designing an entire module, or parts of it, using a learning cycle. In this particular article, Kolb's experiential learning theory was used to structure students' learning of map work skills.

## Designing the First-year Geography Module Incorporating Experiential Learning Theory

In addressing the requirements of the DHET (2015), the module 'Introduction to Social Sciences for the Intermediate Phase' is a compulsory module for all

first-year student teachers at a university in Johannesburg. The module aims to introduce students to the fields of History and Geography. The first-year group in this study consisted of students who had studied History or Geography or both up to Grade 12 level. It is also consisted of students who had never studied History or Geography beyond Grade 9. These first-year Intermediate Phase student teachers were taken for a weekend to *Achterbergh*, an outdoor camp located in Gauteng. The camp took place at the beginning of the year. The aim of the camp was to introduce student teachers to teaching as a profession. An eco-tourism field trip was included in the weekend. This field trip was designed to introduce student teachers to the fields of History and Geography in the Social Sciences. There is an abundance of research pertaining to the advantages of field trips for experiential learning (Dillon, Rickinson, Teamey, Morris, Choi, Sanders & Benefield 2006; Fuller 2006; Greene, Kisida & Bowen 2014; Noel & Colopy 2006). In designing the activity pertaining to student teachers' learning of map work, I grounded their learning in direct observation and concrete experiences. At the camp, activities were designed such that student teachers learnt through direct observation and through group interactions, within the environment. In this camp activity, student teachers, working in groups of 10 - 15, made their way to different locations to study both human-made and natural features that were present at the campsite. I asked students to take as many photographs as possible, using their cellphones, as these photographs would be used for a map work task during their coursework.

In the coursework component, they engaged with interpreting, analysing and drawing maps using different pedagogies such as group work, working with a peer, and whole-class discussions. They were then asked to refer to the Achterbergh camp and write a paragraph describing the route they followed from the conference venue (a site at Achterbergh) to the first, second, third and fourth location at the camp. In the paragraph, they were to include the direction they travelled and the features they experienced along the way, supported by the photographs they had taken of the area. Thereafter, they were to draw a map of the route that corresponded to their paragraph and pictures. Instructions provided for the drawing of the map were that it should include a title; the direction of true north; symbols (their own symbols were designed to show the features in the area); and a key to explain the symbols. Thus, I aimed to integrate the four stages of Kolb's experiential theory, namely, concrete experience abilities (CE), reflective observation abilities (RO), abstract concepttualisation abilities (AC), and active experimentation (AE) to

strengthen student teacher learning of map work. Thereafter, I asked students to reflect on how they would teach map work to learners in the Intermediate Phase of the primary school. In so doing, the next cycle in Kolb's experiential theory commenced by using their concrete experiences (CE) to reflect (RO) and conceptualise (AC).

## Research Methodology

Qualitative research, as described by Merriam and Tisdell (2016), is research conducted to understand how people construct meaning from their experiences. Within a qualitative research paradigm, different terms such as theoretical traditions, approaches, strategies or designs are used to denote the diversity of forms of qualitative research (Merriam & Tisdell 2016). Merriam and Tisdell identify six commonly used approaches or research designs in qualitative research, namely basic qualitative research (also referred to as a generic design), phenomenology, grounded theory, ethnography, narrative analysis and qualitative case study.

This study can be described as a qualitative case study as it involves the description and analysis of a bounded system (Merriam & Tisdell 2016). The bounded system that defines this case study are all first-year student teachers enrolled in the Social Science module. The module is compulsory for all students who specialise to teach in the Intermediate phase of the primary school. The purpose of a qualitative case study is to find out how people interpret their experiences; how they construct their worlds; and the meaning that they attach to their experiences within a bounded system (Merriam & Tisdell 2016). This study, as a qualitative case study, set out to explore how research participants constructed meaning pertaining to their experiences in the learning of map work during coursework and fieldwork and to re-imagine how they would teach learners in the Intermediate Phase of the primary school.

The research participants were purposefully sampled as the sample included all first-year Social Sciences students in the Intermediate Phase programme (n=132). These students attended both the field trip and the post field trip lectures. Data was collected using open-ended questionnaires which provided an opportunity for research participants to express themselves using their own frame of reference (Smith 2000). Please see Table 1 below for purposes of reference.

**Table 1: Questions posed in the open-ended questionnaire**

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|---|
| What comes to your mind when you think about maps? |
| How do you feel about drawing your own maps after your learning in the fieldwork and what was done in the course? |
| What did you learn from this activity? |
| How will you teach map skills to Intermediate Phase learners? |

Informed consent was obtained from all research participants, with participants being notified of the purpose of the research; their role in terms of time; procedures to be used to protect their anonymity and confidentiality; and that their participation was voluntary.

Using In Vivo coding, words or phrases that the participants used in their responses were selected so as to 'prioritize and honour the participant's voice' (Saldaña 2009:74). Data analysis was inductive as the study set out to combine information from open-ended questionnaires, which were then ordered into larger themes, 'as the researcher work[ed] from the particular to the general' (Merriam & Tisdell 2016). Thus data was analysed using qualitative content analysis. As such, I discovered patterns and themes that emerged from the data (Patton 2002).

To ensure that the data collected was valid and reliable, I have provided descriptions in the form of quotes to contextualise the phenomenon under study. Examining the consistency of different data sources derived from the same method, namely open-ended questionnaires, referred to by Patton (1999) as triangulation of sources, was also used to determine the validity and reliability of the data collected and analysed.

## Findings

The following themes emerged that highlight the potential of fieldwork in strengthening pedagogic content knowledge necessary to teach map work skills.

### *Changing the Negative Script that Map work is Complicated*

Almost half of the first-year group had studied Geography up to Grade 12, while the rest of the students last studied Geography in Grade 9. As expected,

students who chose Geography in high school as one of their specialist subjects expressed a passion for the subject, while the group who studied the subject only up to Grade 9 expressed very little interest in the subject. Thus in one class, there were two groups of students who, from their prior learning experiences, had different levels of knowledge of, and attitudes towards, the subject Geography.

Irrespective of whether they studied Geography in the FET phase or not, the majority of student teachers (86%) voiced their dislike of map work. The factors that contributed towards these students disliking map work was that they found it very complicated and challenging. There tended to be a strong correlation between students dislike of map work and their negative experiences at school. Examples from the data show how their recollections of map work triggered 'negative thoughts and attitudes' with memories of how they 'despise[d] map work in high school and as a result would fail'.

These negative attitudes towards map work, and the resultant view that map work is challenging, posed a barrier to their learning of map work in the module. It was clear that the teaching and learning of map work in this module needed a different approach to that which they experienced as learners at school if negative preconceptions were to be changed.

Integrating map work in coursework with learning at the camp seems to have achieved some measure of success in changing students' preconceived views that map work is complicated and challenging. There were numerous instances in the data that support this view, best demonstrated by the following examples. 'It was the best way to learn about maps'; 'It changed my way of thinking about maps'; 'I now see maps less complicated than the way I saw and thought of them before' and 'after this experience, my views about maps have changed as I understand the amount of observation and personal experience that goes into it'.

The process of change was a gradual one for most students, irrespective of when they studied Geography at school. Purposefully scaffolding the learning tasks at the camp and in coursework seems to have helped students change the perspective that map work was complicated. For instance, the following student (Q34) described the change in the following way: 'Having to put all what I saw on paper was the best. Geography to me was all about maps which was complicated to study, until I drew my own map'. Q76 shared a similar view, 'I never thought I can draw maps, and let alone remembering what belonged to the south, east, west and north. I started

enjoying studying maps when I had to draw my own map'. Thus, participant responses suggest that they experienced their learning at the camp as a valuable resource that formed the foundation for their learning in coursework.

However, a few students (4%) had reported that they still felt a bit anxious and overwhelmed and continue to harbour negative attitudes towards the learning of maps skills. One of the reasons put forth was the difficulty they encountered with orientating the drawing using the co-ordinates. For example, Q 4 stated that what he/she visualised 'in the head is not easy to put down on paper'. However, one student reported that she/he would not allow their negativity to influence how they would teach map skills to learners as they would draw on the pedagogies that they engaged with in the module when teaching. These students negative ideas about map work etched from their learning at schools was so deeply rooted that it did not successfully change the view that map work is complicated. More will need to be done to improve the teaching of map work at schools combined with increased support at university to change such perceptions. Nevertheless, the different pedagogies used at both the camp and in coursework gave students a different perspective on how they could teach this concept to learners in the primary school.

## *From Concrete Experience to Active Experimentation*

Student reports about their learning from the concrete experiences provided at the camp led to them experiencing the creation of knowledge when they transferred their observations to drawing their own map. They described their concrete learning experiences of both human-made and natural features on the campsite as allowing them to feel connected to nature. For example, Q 23 stated that he/she had 'never had an experience of exploring the environment' before and now 'felt closer to nature'. One of the reasons for feeling connected to nature as provided by Q 23 was that they had an opportunity to explore the environment and make sense of what surrounds them. It is evident that the first stage of learning from Kolb's four-stage model, namely, that immediate concrete experience (CE) forms the basis of observation and reflection (Kolb 1984) had begun.

The learning in the next stages of Kolb's model, namely, reflective observation abilities (RO), abstract conceptualisation abilities (AC), and active experimentation (AE) were evident when students began translating their first-

hand experiences from the camp onto a map. Students reported that the initial experiences were unsettling to them, as is evidenced by the following comments: 'It was quite a challenging experience'; 'a bit nerve wrecking'; and 'I was feeling lost'. These initial tensions seemed to have spurred their creativity as they began to assimilate their learning into abstract concepts. As students progressed with the map-drawing task, they reported that they were not only enjoying the task but that it stimulated their interest and motivated them to want to learn more. The experience of drawing one's own map of Achterberg seems to have changed their mindsets about maps. For example, Q 33 stated, 'the camp changed my way of thinking about maps. At first I thought they are very boring but as I drew my own in the assignment, I realized it is very interesting'. A similar view was expressed by Q2, 'I thought that maps are just boring and confusing drawings but after doing this assignment I kind of fell in love with it because….I got to put my experience on paper'. Students also demonstrated that in order for them to learn from the map-drawing activity, also referred to as the transformation stage for constructing new knowledge, they first needed to grasp the information learnt in coursework. There were numerous such examples from the data, best captured by the following excerpts: 'maps are fun and easy as long as you understand what you are doing'; 'having a clear understanding of the content makes maps less complex'; and 'if you do not understand how to read maps you will never be able to interpret it'. These comments from students are indicative of them recognizing the importance of having a good understanding of the content knowledge pertaining to map work skills if they are to apply these skills successfully in the map drawing activity.

In addition, concrete experiences acquired from the camp did form the basis for observations and reflections as evidenced by the following statements from students, that: 'exploring the environment' prior to drawing the map 'teaches me to reflect on one's drawings' and 'after drawing that map, I felt good as I have not done anything like that in my past'. Other statements that support this view are: 'It broke my limitations of what I could apply' and prompted 'the need to learn more about maps because they are so interesting'. Q12 explained it succinctly as feeling 'like a true cartographer by coming up with my own keys and using my own hands to create something so beautiful'. The above data clearly demonstrates Kolb's four-stage model of learning where knowledge is created through the transformation of experience. At the core of Kolb's four-stage model, immediate concrete experience forms the

basis of observation and reflection (Kolb 1984). The data does show that concrete experiences at the camp enabled reflection, abstract conceptualisation and active experimentation with the map drawing activity.

## *Learning In and From the Environment Breathes 'Life' into Maps*

Students' understanding of important concepts in map work was strengthened when their learning was linked to the environment. One of the reasons provided was that learning *in* and *from* the environment brought maps to 'life' making learning real and relevant. Once again, there were numerous instances of this in the data, evidenced in the following accounts,

> 'the world of reality fitted onto a small page';
> 'a source of information that is not made up of fictional things, they are replicas of real places';
> 'sometimes you need to do things practical than more theory'; and
> 'map work is very understandable when you have actually been to the place you are drawing a map about. The memory made it easy to draw'.

Learning in and from the environment strengthened students content knowledge pertaining to important map work concepts such as direction, distance, co-ordinates, symbols, scale. Moreover, students were also learning how to apply these concepts when drawing their own maps, resulting in one student drawing the conclusion that 'maps and map drawing are distinct skills in Geography'. The activity enabled an understanding and realisation that maps are important resources that can be useful in daily life. The following comments supports this notion: 'that maps are actually the resources that you can use to get to know a place'; 'interpret weather and climate'; 'learn about landmarks' and 'is a good way to teach people about our environment, what happens around us'.

Using the environment as a learning resource seems to have strengthened specific skills, such as the skills of observation, drawing, listening and communication. Students recognised that the activity taught them the importance of paying careful attention to detail at the camp and in drawing the map. This is evident in the following quotes from students: 'a person has to be

very observant of their surroundings'; 'even small things do matter'; and 'that there are some things we take for granted because we see them every day'. The activity has also developed their skills of drawing, as described by Q 36: 'this assignment has improved my drawing skills and being able to take reality and place it in a drawing'. Another student (Q10) also reported that she/he 'learnt (about) my weaknesses and my strength'. Students were also learning the skills of communication when working in groups. For example, the following excerpt from Q 48 points to the kind of learning that is taking place: 'to respect others and also listen to them and learnt how to interact. Patience is a virtue'. The data thus confirms that the environment was a valuable resource that not only strengthened students' content knowledge but also developed specific skills in map work. The value of experiential learning in providing learners opportunities to develop knowledge and skills (Dillon, Rickinson, Teamey, Morris, Choi, Sanders & Benefield 2006), in this case, pertaining to learning map skills, is evident in the data.

## *Transitioning from Student to Thinking Like a Teacher*

The data confirms that students were able to draw on their own learning experiences to reflect on how they would teach map work to learners in the Intermediate Phase of the primary school. In so doing, the next cycle in Kolb's experiential theory commenced by using their concrete experiences (CE) to reflect (RO) and conceptualise (AC).

The eco-exploration activity at the camp integrated well with coursework to enable students to better understand map work skills, and simultaneously introduced them to strategies on how to teach this section to learners in the primary school. Students expressed the aim to model their teaching on how they were taught in the module. For example, they described how they would take learners outside the classroom to explore their immediate environment, similar to their eco-exploration experiences at the camp, to gain a hands-on learning experience. Students were also able to consider different ways to simulate their learning experiences in the school environment. They recognised that the outdoors was the best learning environment and this is evident in the following comments: 'practical experiences are always the best'; 'I will teach through adventurous activities even outside the classroom'. In addition, students provided examples of learning activities that they will

undertake when teaching learners. The examples they provide is suggestive of them already thinking ahead of what possible difficulties and misconceptions learners may have when teaching map skills. Descriptions from the data that point to this are, 'pointing out the east, west, north and south to make things easier for them'; 'letting them draw a map of the school using a scale' and 'teaching them to pay attention to each feature … to put it in a paper when drawing a map'. The use of visual resources such as drawings and pictures were also provided as examples that could be used to simplify maps to learners. These examples also suggest that students intend to include different learning styles into their teaching. In Kolb's model, different learning styles are incorporated, giving credence to the notion that individuals have preferred learning styles (Kolb 1984).

Students demonstrated the ability to reflect by drawing on specific details that they said contributed to the success of their own learning when re-imagining how they will teach learners. Examples from the data that indicate such reflection are, 'I will do like they did to me at Achterbergh with placing the instructions so that every learner that followed those instructions can do well'; 'I will allow them to share their ideas'; 'I will first help them understand the basics of maps. Give them easier activities and as time goes on the difficulty of the activities will increase to increase their knowledge as well' and 'I will also want them to have fun when doing it'. It would seem that students are reflecting on their own concrete experiences to assimilate a similar experience for their own learners. In so doing, students are demonstrating not only 'how' they would teach, but they are also beginning to conceptualise 'why' they would make specific teaching and learning choices.

## Discussion of Findings

The data supports the view that student teachers learning of map work was strengthened when the module was purposefully designed in accordance with the learning cycle of Kolb's experiential theory to integrate coursework with fieldwork. Specific to student teachers learning about map work, the data confirms that the integration of coursework with fieldwork resulted in the majority of student teachers changing their preconceived views that map work is complicated. From the data, these students did not initially share the same enthusiasm for learning map work. It was clear that student teachers' prior

experiences of learning Geography caused some students to harbour negative attitudes towards the subject. Unfortunately, a few of these students were still not able to move beyond their preconceived notions that map work is difficult, acquired from their school experiences. These negative attitudes will impact negatively on their learning of new concepts and also on how they will teach (Darling-Hammond 2006; Feiman-Nemser 2008). These findings brings to light the need for a more robust professional discourse about how map work is currently taught in South African schools, and the need to begin developing Geography teachers to change the 'how' of their practice.

These forms of prior knowledge and preconceptions about teaching can positively or negatively shape the way that student teachers think (Darling-Hammond 2006; Feiman-Nemser 2008) about the teaching and learning of map work. Feimna-Nemser (2008) asserts that changing preconceived ideas about teaching and learning requires student teachers to critically examine their existing beliefs, against a backdrop of new ideas and understandings. I would argue that integrating fieldwork and coursework in the module design provided the backdrop for such new ideas and understandings. The data confirms that their initial views of map work were altered for the majority of student teachers.

The data also confirms that student teachers' content knowledge of map work had improved when the learning cycle of Kolb's experiential theory was used to integrate coursework and fieldwork. I would argue that such integration contributed towards strengthening the pedagogic content knowledge (PCK) of student teachers. Shulman (1987:8) describes PCK as 'that special amalgam of content and pedagogy that is uniquely the province of teachers, their own special form of professional understanding'. It represents the ability of a teacher to effectively blend content and pedagogy relevant to a specific domain so as to tailor the curriculum and content to meet the needs of learners with diverse abilities (Shulman 1987). Student teachers' learning was strengthened with regards to 'knowledge of the content, of the process for learning this content, and the nature of student thinking, reasoning, understanding, and performance within a subject area' (Darling-Hammond & Baratz-Snowden 2005:17) when fieldwork was integrated into coursework. The data does confirm that student teachers were reasoning and understanding when they indicated that, for them to learn from the map drawing activity, also referred to as the transformation stage for constructing new knowledge (Kolb 1984), they need to first grasp the information learnt in the coursework. As

such, student teachers were clearly reflecting on their own learning. Such reflection represents the early stages of student teachers' development of professional knowledge as they make 'the tacit explicit, meaningful, and useful' (Loughran 2002:38).

From the data, student teachers acknowledged that while the different pedagogies used in the module enabled them to understand map work better; these pedagogies also prompted them to re-imagine how they would teach map skills to learners in the primary school. It was clear that student teachers aimed to model the teaching practices that they experienced in the module. If student teachers are to question their own assumptions and beliefs about teaching, they need to experience their own learning in much the same way as they will ultimately teach it (Darling-Hammond 2006). This, I argue, is crucial to changing student teachers' preconceived notions of teaching and learning in Geography, especially in map work.

The phenomenon of teacher agency surfaced as a crucial variable in enabling student teachers' learning to teach map work skills. In explaining agency, I draw upon the views of Biesta and Tedder (2007:137) who explain that the concept of agency places emphasis on individuals always acting …

> by means of their environment rather than simply in their environment … the achievement of agency will always result from the interplay of individual efforts, available resources and contextual and structural factors as they come together in particular and, in a sense, always unique situations.

The findings of this study points to how student teachers' agency can be developed through learning in concrete settings and through particular ecological conditions and circumstances (Biesta & Tedder 2006), thus enabling student teachers to develop confidence in 'what' and 'how' they teach. I would argue that using the learning cycle of Kolb's experiential theory to integrate coursework with fieldwork enabled student teachers to take 'agentic' action by reflecting and making choices on how they could teach learners map work skills in the primary schools in South Africa. Student teachers were exhibiting the projective dimension of agency, which Biesta and Tedder (2006) describe as not merely repeating past actions but reimagining new possibilities for thought and action.

From the data, examples as articulated by students, such as: 'I will teach through adventurous activities'; 'I would let them draw a map of the school using a scale'; 'I will teach them to pay attention to each feature'; 'help them to learn better through seeing and drawings', demonstrate that student teachers were developing a vision of how they would teach map skills to the Intermediate Phase learners.

As expressed by Biesta, Priestley and Robinson (2015:637), these beliefs do make a difference pertaining to the extent and degree to which teachers, in this case student teachers, are able to 'achieve agency within the particular educational ecologies in which they work' An ecological understanding of agency suggests that it is something that can be achieved in and through engagement, and strongly connected to context (Biesta *et al.* 2015). The locus of agency is about constructing narratives to locate future possibilities over time (Biesta & Tedder 2006).

What has enabled student teachers to develop agency? To answer the question that I pose, I turn to Emirbayer and Mische (1998 cited by Biesta *et al.* 2015:626) who suggest that agency should be understood as a 'configuration of influences from the past, orientations towards the future and engagement with the present'. Drawing on the findings, I would assert that using Kolb's experiential learning theory in integrating student teachers' learning in coursework and fieldwork not only makes learning real and relevant, but it enables student teachers to exhibit agency.

The findings confirm that the majority of student teachers reconfigured their understandings and misconceptions of map work from their past experiences, engaged with the present (learning in coursework and fieldwork) to re-orientate their learning towards their future practices (how they would teach learners).

## Conclusion

This research set out to explore how first-year student teachers merged their learning of map work in a coursework module with a fieldwork component to re-imagine how they would teach learners map skills in the Intermediate Phase of the primary school. The findings support the view that student teachers' learning of map work was strengthened when the module was purposefully designed in accordance to the learning cycle of Kolb's experiential theory to

integrate coursework with fieldwork. In addition, the phenomenon of teacher agency surfaced as a crucial variable in enabling student teachers' learning to teach map work. Student teachers' agency was developed through learning in concrete settings and through particular ecological conditions and circumstances. I argue that by student teachers acquiring a 'hands-on' experiential learning experience that integrates with coursework, student teachers were empowered to take agentic action by reflecting and making informed pedagogical choices on how they would teach this content area to learners in the primary school. As such, the foundations for learning to teach geographical enquiry skills were developed.

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# Geography Student Teachers' Perceptions of Online Problem-based Learning Activities: A Case Study

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## Abstract

As online learning is being embraced in higher education, geography modules that implement problem-based learning can integrate online platforms to support geography curriculum delivery and facilitate student collaboration. The aim of this case study was to explore full-time BEd geography student teachers' (n = 98) perceptions of online problem-based learning activities in two third-year geography modules. The study used quantitative and qualitative research approaches based on questionnaire applications. The findings of the study indicate that the full-time BEd geography student teachers showed positive perceptions regarding the general aspects of online problem-based learning and the online problem-based learning process. Moreover, these student teachers were specifically impressed with the management of the university's learning management system (Sakai named Efundi), Google Docs, as a collaborative online space on which to compile the problem-based learning report. The student teachers also held positive perceptions of the role-players in online problem-based learning, as well as the assessment rubric used to assess the online problem-based learning activities; hence, these have good correlations with online community of inquiry principles.

**Keywords:** Geography education, teacher training, technology, active learning, online problem-based learning, community of inquiry.


Print ISSN 1023-1757; Electronic ISSN: 2519-5476; DOI https://doi.org/10.29086/2519-5476/2018/sp21a7

## Introduction and Problem Statement

Universities and institutions of higher education are increasingly implementing online technologies in instructional environments to enhance teaching and learning experiences. The benefits of using online technologies to enhance learning in higher education are well documented (cf. Hamid *et al.* 2015; Lee 2014). As a result, the number of higher education students enrolling in online courses continues to grow. Most of these online courses are being developed within a learning management system (LMS) software application (Morueta *et al.* 2016). Within this LMS context and platform, collaborative tools, for example discussion forums and wikis, allow high levels of student-to-student and student-to-instructor interaction, which support teaching and learning models suitable for higher education. Moreover, research (e.g. De Wever *et al.* 2010) has shown that asynchronous online discussion is an ideal tool for supporting knowledge construction because students can cooperate and communicate with their peers, share knowledge and solve problems, all of which catalyse high-level thinking.

While online education provides many opportunities to interact and learn across distance and time, many students, according to Rapchack (2017), feel isolated when learning online on their own, and they miss personal interaction with their peers. According to the Community of Inquiry (CoI) model (Garrison, Anderson & Archer 2000), an enriching online educational experience in a collaborative learning environment requires three interdependent elements, namely social presence, teaching presence and cognitive presence. This model has been well studied and researched in the literature and proves to be a meaningful framework for online course development and assessment (Rapchack 2017).

The rapid growth of online learning has led to the introduction of online PBL (Ellaway *et al.* 2015). Traditionally, PBL is usually conducted in classrooms, involving in-person, face-to-face interaction. As online learning is embraced in higher education, the development of online technologies can be used to supplement, or even replace, face-to-face PBL (Ryan *et al.* 2009). The Internet also allows for a different kind of class experience that does not require students ever to meet one another in person. Xie and Kim (2012) advocate the use of wikis for PBL.

With reference to geography and geography teacher training in a South African context, it is clear that relatively little research has been published on

PBL or online PBL in pre-service teacher training settings. However, Dean (1999) argues that PBL offers lecturers an important vehicle whereby student teachers can be exposed to situations they are likely to face as professional educators. Additionally, Veldman *et al*. (2008) also clearly state that very few teaching and learning strategies can achieve the quality of learning in a South African context that is attained when using PBL. They are of the opinion that PBL satisfies all the requirements to help achieve the general aims that are prescribed by the South African Government (South Africa 2011).

## Conceptual and Theoretical Framework

The education system in South Africa emphasises learner-centred education (South Africa 2011), which is based on the constructivist approach to teaching and learning. In constructivist learning approaches, the teacher no longer directs and feeds information to the learners, but guides the learners in discovering information, solving problems, constructing their own learning and understanding their own thinking processes (Aldridge *et al.* 2004). For the purpose of this study, the focus is on social constructivism. Social constructivism functions on the premise that the construction of individual meaning always occurs within the social context. Social constructivism emphasises the role of language, dialogue and shared understanding during teaching and learning. Social constructivism emphasises the acquisition of knowledge through interaction with the environment, instead of the teacher (Aldridge *et al.* 2004). Gergen (1995:21) points out that, within the social constructivist learning environment, the teacher facilitates the interaction between the student and the environment in the student's knowledge construction processes that are embedded in a particular context. Social constructivist teaching and learning strategies, such as PBL, inquiry-based learning and cooperative learning, encourage students to use active methods to create knowledge, based on prior knowledge, and reflect on their learning within a social environment (Ruey 2010; Schreiber & Valle 2013). When students are being trained to become teachers, these teaching and learning principles should be embraced and practised (in lectures) also to adhere to higher cognitive levels (according to Bloom's taxonomy), as prescribed for higher education.

From the South African literature, it is clear that learner-centred instru-

ction has not been taking place in most geography classrooms and that geography teachers have been experiencing challenges in the implementation of learner-centred instructional strategies in the geography curriculum. These challenges include large numbers of learners per class, the deprivation of facilities (such as libraries, internet access and computers), language barriers of geography learners and conceptual and pedagogical difficulties that geography teachers experience with the effective implementation of learner-centred instruction in their classrooms (Alexander *et al.* 2010; Muduane 2016; Wilmot & Dube 2015). With reference to the last-mentioned challenge, it is necessary when training geography teachers, to introduce them to and involve them in learner-centred instructional strategies as well as online learning during their training. In this study, it was decided to involve the geography student teachers to PBL as a learning strategy, as Malan *et al.* (2014) state that PBL brings about the transformation from being a passive learner to being an active problem-solver. PBL can also assist student teachers in this instructional practice transformation. In their study, Park and Ertmer (2008) found that pre-service teachers in the PBL group have changed their intended practices in teaching, learning and technology toward a more learner-centred instruction than those who were in the control group. In the following section, the focus is on PBL as an example of a social constructivist teaching and learning strategy.

## *Problem-based Learning and Geography Education*

PBL focuses on students investigating real-world problems, rather than being directly instructed by lecturers. During the past few years, various geography educators from different countries have implemented PBL in geography and geography education (e.g. Caesar *et al*. 2016; Golightly 2018; Golightly & Guglielmino 2015; Golightly & Muniz 2013; Kwan 2008). It is also necessary to point out that the 2016 International Charter on Geography Education strongly recommended that geography educators should be supported by research that reflects on PBL in geography education (Kolossov, Van der Schee & Lidstone 2016).

### *PBL Models*

In the literature, many variations of PBL models are practised in educational settings around the world. For the purpose of this study, we only refer to ‘pure’

and 'integrated' PBL. In the pure PBL model, PBL is the main teaching and learning strategy implemented throughout the entire curriculum (Savin-Baden 2007), while in an integrated PBL model, PBL is integrated into a traditional teaching curriculum for a period of time (Kivela & Kivela 2005). For the purpose of this study, an integrated online PBL format is followed.

## *The PBL Process*

The PBL process is anchored by an ill-structured, real-world geography problem that has more than one solution, which is presented first. The students may be organised into small tutorial groups in which the students function as members of a team (Chernobilsky *et al*. 2005; Dolmans *et al.* 2001). The students begin to work on the problem and conceptualise their problem into more specific learning issues or objectives. These learning objectives are conceptualised into different learning tasks, and the team members have to do research in their own time and explore various kinds of information, using library resources, textbooks, internet articles and field studies. The students share and work with new information on the problem together (Lam 2009). After the students have discussed and analysed the problem, they gather and apply their knowledge to solve the problem by presenting multiple solutions to it (Tick 2007).

Recently, some studies on the implementation of PBL in online learning environments have been published (e.g. Duncan 2009; Günbatar & Çavuş 2011; Gürsul & Keser 2009; Sulaiman, 2011; Tsai & Chiang 2013). In the online PBL environment, all meetings take place electronically, using the telephone, text-based chat or audio or video conferencing, or asynchronously, using discussion forums or email. The production of reports or presentations on their approach and solution is a common element of PBL activities. Tools such as wikis or Google Docs offer ways for students in different locations to create reports and presentations collaboratively on the same document (Glover 2014). One useful feature is the ability to add comments and automatically include a timestamp and the commenter's name (Ó Broin & Raftery 2011). Tutors or facilitators can be included as observers in each group and thus track the development of the work. The box at the bottom right-hand side shows when another person is editing the document at the same time (Google Docs enables up to ten multiple users to collaborate simultaneously). The revision history is a very useful feature. It archives each saved version, which can be

easily reviewed and allows for comparisons between versions. Note that the changes made to the document are highlighted and colour-coded to indicate who has made the changes (Reynolds 2016).

During the online PBL process, the online tutor provides appropriate scaffolds to students, assesses the group's progress and monitors the contribution of each group member to the group's work (Schmidt *et al.* 2009). It might be that online PBL requires more of a silent presence by the online tutor, along with appropriate hinting and prompting. The loss of nonverbal signals, such as eye contact, facial expressions and so forth, in online PBL, may have presented a decrease in communicative power, making it harder for tutors to give input in online PBL (Strømsø *et al*. 2004). However, various studies (e.g. Günbatar & Çavuş 2011; Gürsul & Keser 2009) report that students hold positive perceptions and attitudes towards the problem-based online learning environment. The study by Gürsul and Keser (2009) states that a PBL approach is more effective than traditional teaching methods concerning a variety of learning outcomes, and it brings about similar positive results when it is applied in online and face-to-face environments. Some of the reasons for this, according to Hazwanie *et al.* (2017), are that online technologies now enable PBL to be conducted anywhere, on any compatible device and at any time. In their studies, Dennis (2003) and Tichon (2002) found no significant difference in learning experience between face-to-face PBL and PBL in an online environment, regardless of learner styles, gender and group dynamics. Against this background, the main purpose of this case study is to explore the perceptions of geography student teachers of the implementation of online PBL in geography education.

## Research Objectives

The research objectives that guided the study were:

- to explore the implementation of online PBL experiences in two different geography education modules in a BEd programme;
- to report on how geography student teachers perceive the online PBL experiences in the third-year geography modules; and
- to determine if the online PBL design of the two geography models is according to the CoI principles as perceived by the geography student teachers.

## Research Methodology

In this explorative case study approach, geography student teachers' perceptions of online PBL are researched. This approach involved the collection and analysis of quantitative and qualitative data (cf. Creswell 2009). This study has been conducted within the post-positivist paradigm. According to De Vos *et al.* (2012), post-positivism is based on the assumption that reality does not exist within a vacuum, but is dependent on and influenced by contextual and situational factors. Post-positivist approaches accommodate different methodological approaches and may include quantitative and qualitative research methods (Glicken 2003).

### *Participants*

The participants in this study comprised all the full-time undergraduate BEd geography students of two third-year modules of consecutive years of a university in South Africa who have completed the online PBL questionnaire at the end of the six-week PBL intervention each year. The total N = 98 (n = 56 in 2017 and n = 42 in 2018). The 2017 student participants only needed to complete the CoI questionnaire (n = 53) to confirm that the online PBL activities are according to collaborative online learning environment principles.

### *Quantitative Data*

In this case study, the one-shot experimental case study design (Leedy & Ormrod 2001:235) consisted of making an observation in measuring the geography student teachers' perceptions and experience of the implementation of online PBL in the two third-year geography modules in a BEd programme.

### *Data Collection and Analysis*

The quantitative data from two questionnaires were collected and analysed as follows:

(1) Using an adapted online PBL questionnaire of Golightly and Muniz (2013) after the implementation of the online PBL activities (see Table 2). The

online PBL questionnaire is a 36-item, five-point Likert scale instrument that measures students' perceptions of the online PBL experiences. The online PBL questionnaire asks respondents to rate how important or relevant to their current learning they perceive each item to be. The students were asked to rate each item on a five-item scale (1 = almost never true of me; 2 = not often true of me; 3 = sometimes true of me; 4 = usually true of me; or 5 = almost always true of me). The online PBL questionnaire is divided into the following sections: general aspects of online PBL (ten items), online technology (seven items), process of online PBL (six items), and role-players (11 items).

The data analysis includes the following: the Cronbach alpha coefficient (α values) for the sections in Table 1 varied between 0.73 and 0.84. All the sections have α values of ≥ 0.7 and can be included for analysis and interpretation. The reliability of the online PBL questionnaire is as follows: general aspects of online PBL ($\alpha = 0.74$), online technology ($\alpha = 78$), process of online PBL ($\alpha = 0.73$) and different role-players, which include the online tutor ($\alpha = 0.76$), the online leader ($\alpha = 0.84$) and the online group members ($\alpha = 0.75$).

Descriptive statistical techniques, such as the mean and standard deviation for the subsections of the online PBL questionnaire, were applied to organise, analyse and interpret the quantitative data.

(2) Community of inquiry (CoI) was measured with the modified CoI instrument, consisting of social presence, cognitive presence and teaching presence (Arbaugh *et al.* 2008). The five-point Likert scale of the CoI questionnaire, which contains 34 items, was adapted to fit the research context, where 1 = 'strongly disagree' and 5 = 'strongly agree'. The overall reliability of the CoI scale was greater than 0.90, and the Cronbach alpha values for the teaching, social and cognitive presences were 0.94, 0.91 and 0.95, respectively, suggesting high internal consistency of the CoI scale. Descriptive statistics were used to examine the participants' responses to the three elements: teaching presence (items 1 to 13), social presence (items 14 to 22) and cognitive presence (items 23 to 34).

The items were used as closely relevant to the current study, so we could accurately measure the participants' perceptions of problem-based learning. For social presence, an example item was 'I felt comfortable conversing through the online medium'. An example item for cognitive presence was 'The topics stimulated my interest in the course', and for teaching

presence, an example item was 'The instructor provided clear instructions on how to participate in course learning activities'. In this study, item reliability was evaluated as $\alpha = 0.82$ for social presence, $\alpha = 0.90$ cognitive presence and $\alpha = 0.94$ teaching presence.

## Qualitative Data Gathering and Analysis

In the online PBL questionnaire, four open-ended questions were included at the end of the questionnaire. The open-ended questions focused on student teachers' perceptions on how the online PBL process could be improved, which online PBL activities they found meaningful, how well the group members worked together online and what could be done to improve the use of eFundi and Google Docs in the online PBL. The participants were also encouraged to elaborate in detail on these questions. The qualitative analysis began with coding the data, dividing the texts into small units (phrases, sentences and paragraphs) and assigning a label to each unit (cf. Creswell & Plano Clark 2007). The qualitative data received enriched the quantitative findings and contributed to a deeper understanding and clarity of the phenomena found.

### *Ethical Considerations*

This study took place within the PBL subproject as part of the Self-Directed Learning (SDL) Project at the North-West University. The SDL project was approved by the Ethics Committee of the university and complied with all the ethical regulations of the university. The participants provided written consent that the information supplied by them could be used in this study.

### *Case Study Context*

The geography student teachers had six weeks (three weeks per online PBL activity) to formulate solutions to the stated problems. During this period, the students had to work on Google Docs on eFundi. Furthermore, the preparation of the geography education students included an orientation session in the form of a two-hour workshop, which included the presentation relating to the process of PBL, online technologies and role expectations of the students and web tutors in online PBL, as well as notes and articles that include readings on

effective group processes, and websites discussing PBL. The students had the opportunity to ask questions regarding the PBL procedures. Prior to the initiation of the PBL activity in the classroom, the students were divided into groups. An online group consisted of four to six members. One of the group members acted as the online group leader. In the online PBL environment, the geography lecturers acted as online tutors for the different online groups. The online group members had to compile the online PBL report on Google Docs, which is embedded in the LMS of the university.

The BEd geography modules in the third year, as indicated in Table 1, were selected for the implementation of the six-week (three weeks per module) integrated online PBL experiences per year. The facilitators developed geography problems that were aligned with one of the module outcomes for each module during the three years. The third-year geography student teachers had to complete the integrated online PBL activities on Google Docs in eFundi. The online PBL groups worked collaboratively in eFundi, the LMS of the university, to complete the PBL activities on Google Docs. The geography lecturers responsible for the two third-year geography modules acted as online tutors during the six-week online PBL experiences.

**Table 1: Third-year online geography problems**

| | | |
|---|---|---|
| **Third year** | **GEOE311 Population Geography and Urban Geography**<br>**Theme: Poor health in low-income urban areas**<br>As beginner geography teachers in a school situated in a low-income informal settlement in Ikageng, Potchefstroom, you become aware that the geography learners in your class are absent on a regular basis. In discussions with the principal, teachers, as well as the clinic | **GEOE321 Climatology and Geomorphology**<br>**Theme: Climate change in South Africa**<br>Global warming and modern climate change are considered a serious problem world-wide and, according to scientists, this threatens the future existence of man on earth. In South Africa there is great concern about the impact that climate change (global warming) will have on our country's people and environment. |

| | | |
|---|---|---|
| | sisters at the nearby medical clinic, the poor health conditions in the low-income dwelling areas are highlighted as the main reason. The government body of the school asks you to provide possible solutions to the poor health problems of learners and residents in the area. | The Department of Agriculture Conservation and Environmental Affairs requests a report from the geography students with reference to the presence of climate change in South Africa, as well as possible measures which the SA government could implement to, firstly, help manage this problem and, secondly, to combat it drastically. The Department also wishes to know what can be done by individuals and households to make a meaningful contribution. |

## Results and Results Interpretation

The findings and discussions of the perceptions, experience and evaluation of the geography student teachers will be discussed under the following themes: 'Evaluation of the CoI elements of the online PBL environment'; 'General aspects of online PBL'; 'Online technology'; 'The online PBL process'; and 'The different role-players in online PBL environment'. After that, the differences in perceptions and experience between male and female student teachers will be discussed.

## Evaluation of the CoI elements of the online PBL environment

Table 2 presents the guideline mean scores, according to Arbaugh *et al.* (2008), for the evaluation of the three elements of the CoI framework regarding the students' experience of an online collaborative learning environment. The three interdependent elements are teaching presence, social presence and cognitive presence, which should be around 4.18, 3.98 and 4.14, respectively, to be deemed as an acceptable and effective online collaborative learning environment.

**Table 2: Summary of the evaluated scores of the three presences of the CoI framework evaluation, as perceived by the third-year geography student teachers**

| Presences | Mean suggested score | Mean online PBL | % Difference |
|---|---|---|---|
| Teaching | 4.18 | 4.27 | +1.8% |
| Social | 3.98 | 4.13 | +3.0% |
| Cognitive | 4.14 | 4.16 | +0.4% |

(Van der Westhuizen 2017, adapted from Arbaugh *et al*. 2008)

From Table 2 it is evident that the online PBL activity of these two geography modules not only complies with the recommended average scores for online collaborative activities as perceived by the students, but is even slightly better, with 4.27 for the teaching presence, 4.13 for the social presence and 4.16 for the cognitive presence (Van der Westhuizen 2017). As PBL is seen as a higher-order learning activity (according to Bloom's taxonomy as reference), this evaluation correlates with findings of Morueta *et al*. (2016) that to perform higher-order tasks online, a strong teaching presence is necessary, which entails continuous guidance, structure and support to students. It is the responsibility of the instructor to design, scaffold, model and coach properly before and during the online activity. Regarding the social presence, the frequency of involvement by the group members will increase as the level of the task (according to Bloom's taxonomy) increases. Richardson and Ice (2010) found that a discussion based on real cases can stimulate more critical thinking than other types of tasks, such as a theoretical study or debate. Case studies showed a remarkable creative component because students had to build solutions to the real problem raised. Therefore, the degree of complexity and the nature of the task seem to condition the level of group cognitive activity. For complex activities, it is necessary to ensure a good social presence to achieve a high cognitive presence (Morueta *et al.* 2016). It can, therefore, be safely argued the online PBL activities, in this instance, adhere to good online collaborative learning environment principles.

## General Aspects of Online PBL

Table 3 represents the mean scores of the respondents' perceptions of general aspects of the online PBL experience. The highest scoring items in Table 3 indicated by respondents include '*The use of online PBL in the Geography module was meaningful'* (mean = 4.33) and '*With time, however, I became more positive about my involvement with the online PBL activity*' (mean = 4.28) and '*Online PBL motivated me to learn*' (mean = 4.02). These results were confirmed with responses from the open-ended questions: '*It was very meaningful because it was thought provoking'* (Respondent 34, male) and '*...to see other students' opinions of different questions extended my own knowledge'* (Respondent 8, female). This is most encouraging, as the implementation of a PBL experience shifts most of the responsibility of learning to the student. These findings correlate with other studies where online PBL was implemented, and students held positive perceptions of online PBL experiences (Duncan 2009; Ng *et al*. 2013). This can best be summarised by the following quote:

> *The fact that we had to do research ourselves, furthermore, you have worked with three other group members, thus you also had to read through their work first to ensure that you don't repeat something and that the work follows a logical sequence. My knowledge about the work improved very much, more so as it would have in contact sessions* (Respondent 91, female).

Interestingly, although on average the respondents indicated that they accepted responsibility for their own learning, the following items rate as the lowest mean averages in the section: *'I prefer online PBL to the traditional lecture-based teaching strategy*' (mean = 3.56) and '*I feel that I can learn online even when I am not being taught by the lecturer'* (mean = 3.32). This lower mean scores indicate that, on average, the respondents still expect their lecturers to explain subject content, identify learning material for them, assess achievement of the learning outcomes and make decisions on their behalf. Another reason for the lower mean scores, as highlighted by Woods (1994), can be that in PBL, it is assumed that students have the necessary skills for problem solving, and this skill takes time to develop, which again may lead to the distrust some students have of online PBL.

These results indicate that online PBL can be effective in enhancing

the student learning experience, but on initial presentation, online PBL may need to be implemented carefully to avoid student anxiety and ensure active participation in online tasks (Duncan 2009). These results also concur with a number of studies on PBL and enquiry-based learning (Nelson 2007) which reported that some students experiencing difficulties in engaging with student-centred learning because it has been the student's first experience of this form of delivery.

**Table 3: Geography student teachers' perceptions of general aspects of online PBL experience**

| ***General aspects of online PBL experience*** | Mean |
|---|---|
| The use of online PBL in the geography module was meaningful | **4.33** |
| With time, however, I became more positive about my involvement with the online PBL activities | **4.28** |
| I acquired new knowledge through completion of the online PBL activity | **4.27** |
| Online PBL as teaching/learning strategy should definitely be integrated with all the full-time geography modules | **4.05** |
| Online PBL motivated me to learn | **4.02** |
| I enjoyed the online PBL activity in the geography module | **3.98** |
| I see problems as challenges | **3.96** |
| I prefer online PBL to the traditional lecture-based teaching strategy in Geography | **3.56** |
| I feel that I can learn online even when I am not being taught by the lecturer | **3.32** |
| Initially I was negative about my involvement with the online PBL activity | **2.89** |

## Geography Student Teachers' Perceptions of Technology in Online Problem-based Learning

Table 4 summarises the mean scores of the geography students' perceptions of the technologies and tools used for the online PBL activities. All the items in this section received high ratings, and with an average mean of 4.24 for the seven items, the students seemed fairly satisfied with the technological support for the online PBL activity. Furthermore, from these results it is clear that the geography student teachers acknowledged that the online environment for the PBL activities added flexibility to their learning, allowing more effective collaborative learning where all the group members could give meaningful input, compared to traditional forms of face-to-face collaboration. This was also strongly supported by the students in the open-ended questions, for example '*that all group members could work on different times and places contributed to friendly collaboration'* (Respondent 16, female), *'that we could see how other members work with us'* (Respondent 2, female), '*it was very comfortable, because we did not have to struggle to get all the group members together, with this method everybody has to contribute'* (Respondent 42, female) *'it all contributed to a quality report which included everybody's point of view'* (Respondent 5, male) and *'we could see exactly who did what'* (Respondent 14, male). As the students had to work simultaneously in groups on their PBL reports on the Google Docs application, this explains why they found the application very effective (mean = 4.33) to execute the PBL activity and to collaborate online (mean = 4.28) – '*the fact that we could work together from a distance and could nicely integrate everything'* (Respondent 77, female) and '*I could ask group members online if my contribution was correct and could get feedback while working'* (Respondent 81, female). Thus, Google Docs aided their collaborative learning, which confirms the satisfying evaluation of the social presence, which is 3% higher (see Table 2) than the norm for online activities. Google Docs and the LMS were also fairly accessible throughout (mean of 4.28), and no major technical issues were reported. The findings from the study by Suwantarathip and Wichadee (2014) confirm that Google Docs play an important role in student learning. Google Docs is a tool that supports students to help one another in learning without restriction of time and place.

The findings of this section of the study further concur with the results of Sulaiman (2011) and Duncan (2009), who both reported that students'

acceptance and perceptions of PBL and online learning were positive and encouraging; this despite encountering some technical issues during the intervention. Moving PBL online can provide scaffolding to support collaborative knowledge construction further (Chernobilsky *et al*. 2005)

**Table 4: Geography student teachers' perceptions of online technology in PBL**

| ***Online technology*** | Mean |
|---|---|
| Google Docs was very effective in the execution of the online PBL activity | **4.33** |
| eFundi and Google Docs were accessible at all times | **4.28** |
| The use of Google Docs supported collaborative learning (group work) well | **4.28** |
| The online technology (eFundi) supported the online PBL process in particular well | **4.27** |
| There were not many technical problems during the completion of the online PBL activity on the wiki tool (Google Docs) | **4.26** |
| The use of online technology can effectively promote teaching and learning in geography | **4.23** |
| The use of eFundi tools made the online PBL activity process easier | **4.04** |

## Geography Students' Perceptions and Experience of the Online PBL Process

Table 5 portrays the means of the student teachers' perceptions of the online PBL process. From Table 5, it is comforting to see that one of the key skills to solving the stated problems successfully, namely to be able to integrate different sources, was also possible online and received a high mean score of 4.41. Furthermore, most of the respondents were of the opinion that their

involvement in online PBL supported their taking responsibility for their own learning (mean = 4.22). These results concur with Duncan's (2009) findings, where the students felt that the use of online PBL within the module allowed them greater autonomy and enabled them to engage with a wider range of literature and to develop greater engagement in the learning process in comparison to traditional lecture-led teaching. The researchers agree with Zhu (2012) that, through online, collaborative written reports, group discussions, debates and critiques of arguments, students can enhance knowledge construction through online PBL.

Surprisingly, the respondents also stated that the formulation of learning objectives was not difficult (mean = 4.21). This differs from findings of Golightly and Muniz (2013), who reported in their study that students experienced difficulties in the formulation of learning objectives in order to solve problems. It is important to highlight that the researchers of this study, who acted as online tutors, gave the necessary guidance and support to students regarding the formulation of objectives in the initial training of the online PBL process, as well as throughout this part of the activity. Interestingly, against the findings of the above-mentioned authors, the respondents pointed out that they found it, to the contrary, not easy to do research about the set learning objectives.

**Table 5: Geography student teachers' perceptions of the online PBL process**

| **Process of online PBL** | Mean |
|---|---|
| Online PBL enables you to integrate different sources to solve the problem | **4.41** |
| My involvement with the online PBL activity will support me to learn on my own | **4.22** |
| The group found it easy to identify the learning objectives of the online PBL activity online | **4.21** |
| The assessment rubric for the online PBL activity assisted to solve the geography problem successfully | **4.08** |

| | |
|---|---|
| The geography themes used during online PBL were very interesting | **3.98** |
| The group found it easy to do research about the set learning objectives | **3.76** |

## Geography Student Teacher Perceptions of the Different Role-players in an Online PBL Environment

Table 6 depicts and compares the geography students' perceptions of the different role-players in the online PBL activities, namely the online tutor, the online group leader and the online group members. The feedback from the respondents with regard to the conduct of the online tutor during PBL tutorial sessions was very positive, with high mean scores of 4.71 and 4.62 regarding tutor feedback and guidance (see Table 6). From the open-ended questions, very positive feedback was received from almost all of the participants, for example: '*We received continuous feedback and guidance as we work from the lecturer'* (72, female) and '*…he could help us when we are on the wrong track much quicker and contributed to a much better end report, which was not possible in face-to-face environments...and the fact that we all knew the tutor can see who does what'* (11, female). The researchers agree with Schmidt *et al*. (2009) that the tutor, or online tutor, is not a passive observer; he or she must be active and directive about the learning process to assure that the group stays on target and makes reasonable choices on what issues to study. Duncan (2009) points out that the online tutor must provide greater initial scaffolding of students' collaborative working environments (Google Docs in this instance), as they are new to this form of learning. The importance of the online tutor is highlighted by the study of Choo *et al.* (2011), which investigated the impact of scaffolds on student learning as perceived by students. In their study, it was found that, out of the various types of learning supports provided in a PBL environment, students generally viewed tutor interventions and collaborative small group learning as the most important scaffolds for their learning. This information strongly concurs with an acceptable teaching presence (according to Morueta *et al*. 2016) in the CoI (see Teaching presences in Table 2), also confirmed by a response from the open-ended questions:

'*…the management of the online activity by the tutor was excellent'* (Respondent 53, male).

During the implementation of PBL in the geography modules, it was evident that the online group leaders of most of the groups performed this task effectively. Most of the respondents were of the opinion that the group leaders treated the group members with respect, performed their duties effectively and involved the group members in meaningful group discussions (Table 6). With regard to the statement in the questionnaire, '*The group leader effectively involved all members of the group online to participate in the completion of the online PBL activity*', the mean was 4.05.

All the group members in the PBL environment had to collaborate online in order to produce viable solutions to the stated geography problems presented. It is enlightening that the respondents pointed out that the group members displayed respect and understanding for one another's opinions. The item '*Group members respected each other's opinions*' (mean = 4.17) received the highest rating, followed by the item '*The group members knew what was being expected of them in the completion of the online PBL activity*' (mean = 4.11). From the open questions, many positive comments were received regarding the effective online collaborative support from the technology and how this method also encouraged the group members to work continuously and effectively: '*It forces you to improve your self-discipline, to want to work effectively together, and to make valuable contributions to get the approval of members'* (Respondent 23, female).

The item '*Group members critically assessed fellow group members' contributions*' (mean = 3.83) received the lowest rating. But if taken into consideration that an acceptable perception of social presence online (according to the CoI framework) is a mean score of 3.98, the group members' involvement is still deemed to be adequate (see Table 2). In fact, the evaluation of the social presence of this PBL activity was higher, with a mean of 4.13. It is necessary to highlight that for most of the respondents, this was their first encounter with online PBL. It is important that online tutors should guide, scaffold and facilitate these students to assess fellow group members' contributions critically (Choo *et al*. 2011). In this regard, Google Docs assisted in the monitoring of the students' contributions on a daily basis and provided a history of the activities of individuals. As such, the group members were more serious about collaborating and willing to follow the group conventions and practices. This concurs with findings from Suwantarathip and Wichadee (2014).

**Table 6: Geography students teachers' perceptions of the different role-players in the online PBL process**

| **Role-players** | Mean |
|---|---|
| **Online geography tutor** | |
| The online tutor provided the groups with regular feedback about solving the geography problem | **4.71** |
| The online tutor was available to guide students in solving the geography problem | **4.62** |
| **Online group leader** | |
| The group leader managed the online PBL process well | **4.18** |
| The group leader effectively involved all members of the group online to participate in the completion of the online PBL activity | **4.05** |
| **Online group members** | |
| The group members respected one another's opinions | **4.17** |
| The group members knew what was being expected of them in the completion of the online PBL activity | **4.11** |
| The online PBL activity assisted me to develop positive interpersonal relationships with the group members | **3.79** |
| The group members collaborated well online to solve the problem | **3.92** |
| All the group members did their part in solving the online problem | **3.91** |
| The group members critically assessed fellow group members' contributions | **3.83** |
| The group members influenced one another negatively about the online PBL activity | **2.07** |

## Conclusions and Recommendations

The results from this study show that geography student teachers in a South African context perceive online PBL to be an effective teaching and learning strategy. Online PBL appears to have offered a more student-driven approach to learning, which better facilitated skills such as searching for content, retrieving information, online collaborative learning and online discussions to share ideas and information in order to solve the stated geography problems. Online PBL enhances accessibility, flexibility and convenience for geography student teachers in working any place and at any time. For the effective implementation of online PBL, it is necessary for all the role-players to do their part in a collaborative learning environment. In this study, geography student teachers highlighted the important role of the online tutor to guide, scaffold and support them in solving problems online. They indicated that the online group leaders and group members had collaborated in an effective and meaningful way in solving the problems online. Taking into consideration that it had been their first encounter with online PBL for most of the student teachers, it would have taken them time to develop the necessary problem-solving skills. However, most of the student teachers were of the opinion that the online PBL had motivated them to learn.

When teaching and learning take place online, it is crucial that these adhere to good online design and implementation principles. According to the CoI framework principles of determining the effectiveness of the three interdependent elements, namely the teaching, social and cognitive presences, it is found that this online PBL activity was well above the norm. As PBL is a higher-order learning activity (according to Bloom's taxonomy), it is important to ensure, when it is done online, that effective, continuous collaboration is possible. This study proved to have an excellent social presence that made a higher level of cognitive presence possible. It seems from the findings of this study that it is more effective to conduct PBL online than in contact environments. In this regard, it must be emphasised that the use of Google Docs, as an online collaborative application managed within the LMS of the university, ensured that all the role-players contributed to solving the stated geography problems.

The findings of the study can be used as feedback to geography lecturers in the implementation of online PBL in geography modules. It is also suggested that further studies might explore diverse online PBL modules in

different subject areas or disciplines, as well as at different levels of learning, in order to determine students' perceptions in different contexts. It is also necessary that future research explore extra supportive technologies for online PBL. It is recommended to consider using online PBL for part of a module in the various academic years in a programme because of the workload of lecturers and student teachers.

To improve the online PBL process, the geography student teachers recommended smaller online PBL groups and the implementation of a chatroom platform on the LMS. They highlighted the most meaningful aspects of online PBL to be the collaboration online, which established a sound social presence, and the continuous support and commentary of the online tutor.

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# The Impact of Using Geography Open Education Resources (OER) to Capacitate Natural Science Teachers Teaching the *Earth and Beyond* Strand in South African Schools

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## Abstract

In 1994 South African curriculum developers decided to include aspects of Physical Geography in the Natural Science Intermediate and Senior Phase curriculum as a strand named *Earth and Beyond.* One of the complicating factors was that most in-service teachers that had to teach this strand had no training in post-school Geography or even worse, might not have taken Geography in the last three years of schooling. Research was undertaken to determine how the gaps in Geography knowledge, skills, resources and teaching skills amongst Natural Science teachers, with special reference to the *Earth and Beyond* strand in Natural Science teaching, could be overcome. A baseline survey was conducted and initial school visits were undertaken to determine what the situation was regarding the teaching of the *Earth and Beyond* strand in schools in a mostly poor rural school district in Kwa-Zulu Natal, South Africa. Findings indicated that none of the Natural Science teachers visited, had any post-school training in Geography. Classroom observations indicate that more than 90% of the teachers use only direct instruction when teaching the *Earth and Beyond* strand; they use only

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Print ISSN 1023-1757; Electronic ISSN: 2519-5476; DOI https://doi.org/10.29086/2519-5476/2018/sp21a8

textbooks and less than 10% of classrooms have even the basic resources like a globe or an updated map. An intervention strategy aided by the use of needs driven purposefully designed Open Education Resources (OER) was undertaken and a pre- and post-test were written to determine the impact of the intervention. This was followed up by personal interviews and follow-up school visits to determine the possible sustainability of the impact in practice. Findings indicate that the intervention had a significant immediate impact and that some of that was sustained in practice because of the use of Open Education Resources (OER).

**Keywords:** OER, intervention, pedagogic knowledge, content knowledge, Natural Science, Earth and Beyond, Geography teaching

## 1. Introduction

In 1994 South African curriculum designers and developers decided to include aspects of Physical Geography in the Natural Science intermediate and Senior Phase curriculum as a strand named *Earth and Beyond*. The inclusion of Physical Geography in the Natural science curriculum that stems from the Outcomes-Based Education (OBE) curriculum has been retained in the subsequent National Curriculum Statements (NCS) and Revised National Curriculum Statements (RNCS) (Department of Education [DOE] 1997) as well as the current Curriculum and Assessment Policy Statements (CAPS) (Republic of South Africa [RSA] 2011).

This inclusion of Physical Geography in Natural science teaching had some perhaps unforeseen effects in schools. One of the complicating factors of the implementation of a Natural Science curriculum containing geographical elements was that many in-service teachers that had to teach the *Earth and Beyond* strand had no training in post-school Geography, since no teacher education programmes offered training in this strand when it was implemented. The *Earth and Beyond* strand is one of four strands taught in Natural Science Senior Phase (Grades 7 - 9) and as such should be allocated 25% of teaching time. Without Geography specific Pedagogical and Content Knowledge (PCK) it would be unreasonable to expect these teachers to teach the *Earth and Beyond* strand effectively.

As far as could be determined no research has been undertaken to esta-

blish what the situation is regarding the teaching of *Earth and Beyond* strand and if interventions to assist Natural Science teachers in teaching it had the desired effect. It was therefore the purpose of the study to undertake research by:

- determining what the status is regarding the teaching of the *Earth and Beyond* strand in a poor rural educational district in KwaZulu-Natal;
- purposefully designing needs-driven OER based on teacher needs;
- undertaking an intervention through intensive workshops using the OER focused on identified gaps in geographic knowledge and teaching skills; and
- determining if the intervention to empower Natural Science teachers to teach this strand had an impact in schools.

The research question therefore was: Will an intervention that includes focused needs-driven purposefully designed Open Educational Resources (OER) with the aim to improve geographical content and pedagogical knowledge have a positive impact on out of field/out of speciality teachers teaching the *Earth and Beyond* strand?

Open Educational Resources (OER) are freely accessible, openly licensed documents and media that are useful for teaching, learning, and assessing. It is the leading trend in the distance education/open and distance learning domain as a consequence of the 'openness' movement (Bozkurt, Akgun-Ozbek, Onrat-Yilmazer, Erdogdu, Ucar, Guler, Sezgin, Karadeniz, Sen, Goksel-Canbek, Dincer, Ari & Aydin 2015:330). Rural teachers have limited access to educational resources and this research endeavoured to determine whether the use of OER during interventions could enhance not just teacher Pedagogical Content Knowledge (PCK), but also expand their access to educational resources for their learners to benefit from.

The context where the research was undertaken was an extremely poor rural area in KZN in South Africa. The schools differed in terms of the infrastructure and available equipment, but all were under-resourced with predominantly poor learners and parents. All schools were fully staffed, but some of them were out of field/out of speciality teachers, teaching subjects they were not fully trained for, particularly in Sciences and Mathematics.

## 2. Literature Review

One of the most problematic issues impacting negatively on achievement of learners is the number of out of field teachers (Rotherham n.d.) which is a worldwide concern (Du Plessis, Carroll & Gillies 2017). Teachers teaching the *Earth and Beyond* strand in South Africa are effectively part of this group of teachers, because the strand they have to teach is new and relatively few Natural science teachers have received Physical Geography training to empower them to teach the strand. Rotherham (ibid.) postulates that it is a situation similar to what happened in the USA, where 66% of teachers in deprived schools have not been trained for the subjects they teach. This lack of training has hampered efforts to close the achievement gap in such schools.

In 2003 John Hattie published ground-braking research based on 500 000 studies to determine which variable has the greatest influence on learner achievement. The largest influence, except for the learners themselves, is by far that of teachers (Hattie 2003). Successful learning can directly be aligned with the quality of teaching received (Rotherham n.d.; Haycock 2007) and quality teaching in turn is directly dependent on the subject knowledge of the teacher (Buckingham 2005; Ball, Thames & Phelps 2008; Stronge, Ward & Grant 2011).

In his research Hattie (2003:7) also found that expert teachers can be distinguished from other teachers, because of their ability to 'organise and use' their subject knowledge (Hattie 2003:5). Very significantly, another finding was that excellent teachers are better at 'guiding learning through classroom interactions' (ibid.).

According to Sanders and Rivers (1996), Kain (1998), Fallon (n.d.) and Mondal (2014) good teaching mostly results in better learner achievement. Such achievements will improve even further if there is a continuation of good teaching. Even in cases where learners were subjected to poor teaching for a long time they will improve substantially when they are exposed to effective teaching. Moreover, when effective teaching continues year after year, the impetus is observed.

Findings by Haycock (2003) support this view and indicate that research has proven that:

- Substantial improvements in achievement are possible even for disadvantaged poor learners if they receive quality teaching;

- Receiving quality teaching four consecutive years can close the achievement gap between learners; and
- The influence of a quality teacher on learner achievement is 20% higher than any other variable, even when considering the size of the class and poverty.

Leigh and Mead (2005) similarly found that knowledge and teaching skills of teachers are the most important factors that influence learning. Efforts to improve learning should, therefore, take cognisance of these aspects (Fallon 2003). Pas, Bradshaw, Hershfeldt and Leaf (2010), who are of the opinion that targeted interventions should be used to support teachers towards improvement of Content Knowledge (CK) and skills to teach their subject, echo this.

The early history of teacher education was primarily focused on teachers' knowledge of subject content (Shulman 1988). CK alone is however, not enough for effective teaching. It is more important how CK is used during teaching than just having in-depth CK. In other words, what should be aimed for is expert PCK which can be described as a synergy between CK and PK.

The key to distinguishing the knowledge base of teaching is found at the intersection of content and pedagogy, and the capacity of teachers to transform the CK they possess regarding forms that are pedagogically powerful and yet adaptive to the variations in ability and background presented by the students (Shulman 1987; Kleickmann, Richter, Kunter, Elsner, Besser, Krauss & Baumert 2013). The conclusion is that effective learning may be achieved through effective teaching by teachers equipped through targeted capacity building interventions with successful strategies that work (Rowe 2006), which was the intention of the intervention reported on in this article.

Yuan and Kueilan (2006) are convinced that technology and pedagogy should be 'married' in modern times. Mishra and Koehler (2005) go even further and assert that deep conceptual learning, requires the development of a complex, situated form of knowledge named Technological Pedagogical Content Knowledge (TPCK) which in essence is the complex interplay among three main components of learning environments: content, pedagogy, and technology.

The acronym was later changed to TPACK (Thompson & Mishra 2007) to emphasise the fact that knowledge of technology does not automatically transfer into effective teaching with technology (also called

instructional computer use by Sahin 2011). Teachers have to learn how best to utilise technologies that will support specific pedagogies in a particular subject (Thompson & Mishra 2007).

Mays (2011) is of the opinion that teachers need to be capacitated to use technologies that are most appropriate to their contexts and needs and many OER are available to accomplish just this. Although OERs have been used for almost a decade they are relatively new in South Africa (Czerniewicz & Goodier 2014) and teacher education institutions could benefit from modelling and using OERs in their programmes and interventions. The use of OERs enriches the learning experience (White & Manton 2011) and the materials are more up to date, but more importantly they:

- Address teachers' specific needs through providing opportunities for supplementary learning, skills development and presenting content in different ways to address students' interests and preferences;
- Save teachers effort, through enabling them to offer their students learning materials where they lack the skills or the means to create these themselves;
- Enable teachers to teach topics that lie outside their current expertise;
- Stimulate networking and collaboration among teachers (Masterman & Wild 2011).

Taylor and Vinjevold (1988) conducted research on teachers and teaching in South Africa and made two very significant findings: teachers did not know the curriculum content therefore making numerous mistakes when teaching it and teachers almost exclusively used direct instruction as their mode of delivery. More recent research in South Africa by Spaull (2013) indicates that the lack of CK remains a big concern. Natural Science teachers have great difficulty in teaching geographical aspects (the *Earth and Beyond* strand) if they do not have sufficient knowledge of the subject. They are therefore, unable to transfer accurate in-depth knowledge (Lane & Catling 2016) even if they have the skills to teach.

Although research has shown the benefits and importance of initial direct instruction (Rowe 2006), this could be built on, followed by or combined with constructivist approaches to try and ensure deeper and richer conceptual

learning. There is a concern that teachers may however exclusively use only direct instruction in their teaching.

Du Plessis (2015) did some informative research on out of field teaching in South Africa and the challenges associated with this phenomena, but no research was found specifically dealing with Natural Science teachers who have no training in Geography, but have to teach the *Earth and Beyond* strand dealing with Physical Geography. There is also a dearth of research on the influence of OERs in teacher professional development in South Africa. In Africa and India respectively TESSA and TESS-India projects are run by the Open University in the UK, where OERs are being utilised to upgrade teacher knowledge and skills with very positive results (Buckler, Perryman, Seal & Musafir 2014).

The theoretical framework for the study was informed by a Theory of Change, the spiral model of supporting learning interventions (Sguazzin & du Toit 2000) and a conviction based on experience and research that participants must be consulted before an intervention regarding the approach and structure of the intervention and that their real needs must be determined beforehand (Dreyer 2014).

A theory of change is a 'plan' of how a desired change is to be achieved in a particular context. It maps the way in which an intervention and its associated activities are going to take place to achieve its desired goal or outcome. In this research the desired change that was aimed for as a result of an intervention utilising purposefully developed needs driven Geography OER is the improvement of Geography subject content knowledge and teaching skills of teachers teaching the *Earth and Beyond* strand as part of Natural Sciences in the Senior Phase.

The spiral model makes provision for several interventions spread over time. This makes it possible to implement what was learned at a first workshop of an intervention and to then come back for a second workshop to discuss successes and challenges with other participants and reflecting on their practice (Dreyer 2014) before receiving additional training, going out to try it out in practice and coming back for further training. In this way, participants can reflect on their practice as 'The learning and understanding that grow within a particular context are a direct response to local realities' (Du Toit, Pollard, Dlamini & Chuma n.d.:14). In the intervention reported on in this article there were four workshops conducted over two years representing four cycles or spirals of training, implementation and reflection. Real needs of participants

that were going to be involved in the intervention were determined through pre-intervention school visits and a baseline survey, which are discussed later in this article.

## 3. Empirical Research

Research was undertaken over a period of three years and in a number of different ways. To start off Senior Phase Natural Science teachers in a school district in KwaZulu Natal were invited to take part in an intervention that would aim at improving their CK and teaching skills in Natural Science. Lecturers of the University of South Africa presented the workshops for the duration of one full day each. Ten workshops were held per year. Four of the workshops presented (the intervention) were reserved for the *Earth and Beyond* strand. The twenty teachers that enrolled for the workshops were the participants in this research.

The OER used during the intervention were purposefully designed and focused on areas of teacher needs identified during pre-intervention school visits and the baseline survey participants completed during registration for the workshops. They consisted of the following:

- A description accompanied by a video on doing group work in Geography (it was determined in the pre-intervention observations that teachers did not know how to do this effectively);
- A description accompanied by a video on doing an experiment in Geography: the example used was how to demonstrate the forming of clouds (it was determined in pre-interviews that teachers believed that it was difficult and expensive to do experiments and the example indicated how it could be done without incurring any costs); and
- A description accompanied by photos of geographical features on how to use images in Geography (it was determined in pre-intervention observations that there was a lack of resources, particularly visual images of geographical features in classrooms and the OER are downloadable on cell phones so that they can use it continuously).

Other elements of the workshops included all CK needed to teach the *Earth and Beyond* strand. It also included aspects of getting to know your school

environment, effective teaching methods associated with the teaching of the strand with an emphasis on learner-centred pedagogies, the use of sources other than only the textbook (newspapers, books, artefacts), integrating technology in teaching and learning and 'geographying' your classroom. These were all areas identified in the pre-intervention school visits and the baseline survey.

At registration of the intervention teachers had to complete a questionnaire that was used as a baseline survey to determine what the situation was in their schools regarding the teaching of the *Earth and Beyond* strand. The objective was to determine the training background of Natural Science teachers and whether the teaching of the *Earth and Beyond* strand received the required attention in their teaching. They were also asked what their needs were regarding the proposed intervention so that lecturers could focus on these areas during the workshops. When attending the first workshop they wrote a pre-test to determine the level of geographic knowledge and skills they had before the intervention took place. After the intervention which spanned a period of two years (in the form of workshops employing amongst others a number of OER), they wrote a post-test to determine the immediate impact of the intervention.

Before the intervention personal interviews and observations during five school visits were undertaken to determine how the *Earth and Beyond* strand was taught and the intended reasons were probed. Five schools were purposefully selected for this part of the research. They included better-resourced and lesser resourced schools; some were rural and some were town schools; both genders were well represented, since some teachers at the schools were male while others were female. The motivation of the researcher was to include schools and teachers representing different contexts and genders. The coordinator of the workshops furthermore knew the teachers teaching in this area and assisted in identifying five that would in his opinion be able to provide rich information from different perspectives. An interview schedule and an observation schedule were used to gather data.

The same teachers were visited again a few months after the two year intervention programme. Five interviews were held and five classroom observations were done with the same teachers at the same schools using the same interview and observation schedules utilised before to determine if actual changes took place in practice and if the initial knowledge and skill gains after the workshops were sustained.

School one was a school on the outskirts of a rural town and had good infrastructure in terms of enough classrooms and furniture for all learners. The

Natural Science teacher had no education in post-school Geography. School two was a school on the outskirts of a tiny village and had adequate infrastructure in terms of enough classrooms and furniture for all learners. The Natural Science teacher had no education in Geography. School three was a very remote rural school with inadequate infrastructure. The Natural Science teacher had no education in Geography. Schools four and five were very old rural schools where infrastructure was deteriorating and in desperate need of repair. The Natural Science teachers had no education in Geography.

## 4. Research Design

Because the researcher wanted multiple sources of data to determine if the intervention that took place was effective, and these sources involved methods from different paradigms, it is believed that a pragmatist paradigm was best suited to this research. A fully mixed sequential equal status design was therefore employed as described by Leech and Onwuegbuzie (2009).

As is often the case when one wants to determine the effectiveness of interventions the type of research chosen was experimental – a quasi-experimental single group pre- and post-test design – within the quantitative research approach (De Vos, Strydom, Fouché & Delport 2011). The motivation was that only one group of participants was available and it was not possible to have a control group. The pre- and post-tests were used to determine if there was an increase in knowledge and skills directly after the intervention within this one group. Because the researchers also aimed to determine if the gains in knowledge and skills were employed in classrooms it was decided to also do pre- and post-classroom observations and interviews with teachers which resorts under the qualitative research approach. The results were expected to indicate if there were longer term gains in knowledge and skills several months after completion of the intervention.

Even if one accepts that the lived experiences of teachers and their actual classroom performances provide authentic, truly context associated and thick information, the disadvantage of such research is that the participants are too few to make any generalisations possible. The findings are, however, still valuable and similar research might be replicated in similar contexts to contribute to the corpus of knowledge on a topic.

The research process is demonstrated in the following flow-diagramme (Figure 1).

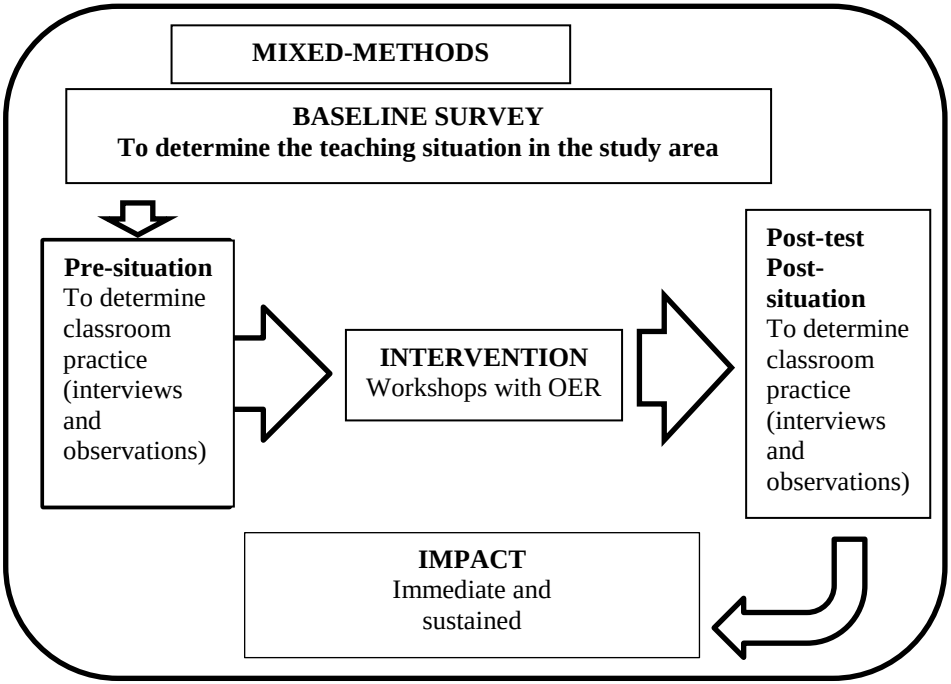


**Figure 1: Research design**

## 5. Data analysis

The pre- and post- test results are presented as a combined comparison graph to indicate the improvement of knowledge and skills that resulted from the intervention. The interviews and observation data were analysed as described by Elliott and Timulak (2005) and Cresswell (2017) and started by reading and re-reading the interview transcripts and the observation notes. The researcher identified meaning units that were aligned to the objective of increasing Geography knowledge and skills. These units were assigned to broad domains after which data that had similarities and connections to one another were sorted into categories. The categories were examined for significations (that is, the meaning and the implications of what Natural Science teachers were conveying in the interviews and what was observed in the classrooms). From the categories a number of themes emerged.

Themes regarding interviews were: time spent on teaching *Earth and Beyond*, teaching strategies, Geographical knowledge, teaching and learning materials and the use of technology and OER. Themes regarding observations were: classroom environment, use of teaching and learning materials and media, use of OER, Geographical concepts and Physical Geography curriculum.

# 6 Findings

## *6.1 Baseline Survey*

It was established that only 8% of Natural Science teachers studied Geography at level four (matric) and none at level five or higher (post-school studies). Furthermore only 24% of them did any Science education in their post-school studies and that just at level 5 (first year at college or university). Areas of need listed previously were identified to facilitate the intervention and to highlight real teacher needs and preferences.

## *6.2 Pre-test and Post-test*

Pre- and post-test scores are represented on the following graph (Figure 2):

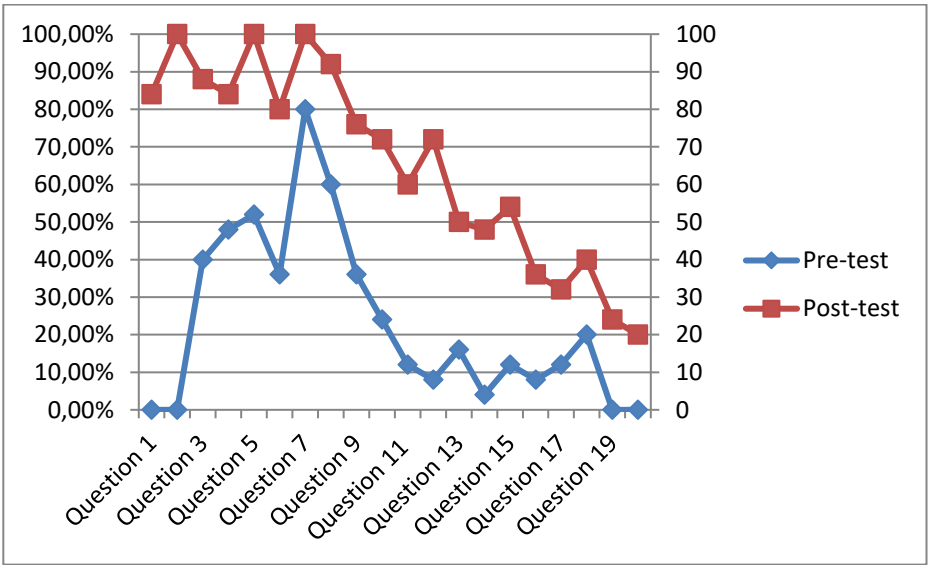


**Figure 2: Graph of pre and post-test scores**

The comparative graphs indicate an increase and development in knowledge (first 10 questions) and smaller skill improvements were also detected (question 11-20 from simple to more complex skills) in terms of Geographic knowledge and skills. It is clear that there has been an immediate positive impact on the Geography knowledge and skills of the teachers after the workshops.

## *6.3 Interviews*

Because there were before and after interviews it was thought best to use a table (see Table 1) to present the findings according to emerging themes:

| **Emerging theme** | **Interview before intervention** | **Interview after intervention** |
|---|---|---|
| Time spent on ***Earth and Beyond*** (supposed to be 25%) | Only 8% of teachers spent 25% of their time on *Earth and Beyond*. Reasons given:<br>'I only know what is in the book (teacher guide)'.<br>'We are not trained'.<br>'They tell us teach this and teach that but do not show us'. | 30% of teachers spent 25% of their time on *Earth and Beyond*. Reasons given:<br>'I learned much like making models'.<br>'I started by telling them about their own place – I did not know to do it before'.<br>'For many things I am still not sure'.<br>'If I can learn more, I can be able to do more'. |
| **Teaching strategies** | 88% of teachers used only direct instruction and 12% did some group work where learners participated. Reasons given:<br>'We had only one day training – they | 72% of teachers used only direct instruction, 16% used group work, 4% did some outdoor learning and 8% used experiments and/or model building. Reasons given:<br>'We now throw nothing away so we can make models'.<br>'We go outside and look at the clouds'. |

| | | |
|---|---|---|
| | tell us what to do but do not show us'. | 'I use group work different now as I never knew how before'.<br>'I show them the experiment we saw on the video (part of the OERs) … the one of the ice and the clouds'.<br>'Once you know yourself, you can show the learners'.<br>'I tried the example (from the OERs) and the learners they participated and enjoy the task'. |
| **Geographical knowledge** | Most teachers received one day of training which covered all four strands of Natural Science and some also attended irregular cluster training. Comments:<br>'The trainer also did not know about the planets and the climate'.<br>'They said we must read to know the content'.<br>'At the cluster training they could not answer all our questions'. | The teachers attended the intervention which constituted 4 one-day workshops. Comments:<br>'I am able to answer many questions'.<br>'The learners and I know many facts because we prepare for the Geography quiz against other schools. It is the first time we decided to compete after the workshop which opened my eyes'. |
| **Teaching and learning materials** | Used only text books (teacher guides and learner guides) supplied by the | Used mostly only text books (teacher guides and learner guides) supplied by the Department of Basic Education. Some exceptions occurred: |

| | | |
|---|---|---|
| | Department of Basic Education. Reasons: 'The books have everything we need'. | 'They (the learners) bring newspapers and we talk about (Geographical) things in there'. 'I use the poster with the pictures of the planets'. 'The learners created all the planets as we learned from the workshop and we hang them from the ceiling'. |
| **Use of technology and OERs** | No use of any technology. | Some use of technology took place (notably cell phones and video shown on a computer). 'I take photos (of geographical landmarks) with my cell phone and show the learners'. 'We played the cell-phone scavenger hunt game about pollution and they (the learners) enjoyed it very much'. 'I showed them the video on the computer and then it was easy to do it' (the experiment on the video included in the OERs). |

**Table 1: Results of the before and after interviews**

From Table 1 it is clear that there was a lack of geographical (*Earth and Beyond*) knowledge and skills amongst the research participants before the intervention. This was evidenced by a lack of time spent on the teaching of *Earth and Beyond*, poor or no training in Geography as well as Science and no use of teaching and learning materials (other than text books) and technology. It was however encouraging to see important improvements on the time spent on the *Earth and Beyond* strand in the school time table (an increase of 22%), extended geographical knowledge, some use of active learning methodologies and the use of technology (especially related to the OERs) after completing the intervention workshops.

## *6.4 Observations*

Because there were before and after observations it was thought best to use a table (see table 2) to present the findings:

| **Emerging theme** | **Observations before intervention** | **Observations after intervention** |
|---|---|---|
| Classroom environment | There were very few posters, pictures, etc. on the walls. Only one classroom had anything that could be associated with the *Earth and Beyond* strand. Two classrooms were neat and clean and without any broken windows. | Some geographical newspaper articles and a few posters were added to walls in two classrooms. In three classrooms there was at least one map. Two classrooms were neat and clean and without any broken windows. |
| Use of teaching and learning materials/media | No use of materials/media in observed lessons. Textbook used by all teachers. | Materials/media used by two of the five teachers in observed lessons. Textbook used by all teachers. |
| Use of OERs | No use of OERs | One teacher used Geographical images from an OER and integrated them well in her lesson. One teacher used group work as demonstrated using an OER reasonably well. |
| Geographical concepts | In one instance the teacher made a mistake with content when she could not identify indigenous plants and gave wrong examples. | In one instance the teacher made a mistake with content regarding landforms (fluvial processes). |

| | | |
|---|---|---|
| Physical Geography curriculum | Only one of the teachers had curriculum documents and could identify the origin of the lesson. | Four of the teachers had curriculum documents and could pinpoint the origin of the lesson. |

**Table 2: Before and after observations**

The initial observations revealed poor conditions in the classrooms with a lack of equipment, lack of teaching and learning materials/media and wall decorations and even some content mistakes in the presentations of lessons. A lack of use of OER was observed. Observations after the interventions revealed some improvement in the use of learning materials/media and wall decorations and other resources but content knowledge and the use of curriculum documents still posed a problem. There was some evidence of the use of the OER provided.

## 7. Discussion

From the pre- and post-test it was clear that a focused intervention which included integrated technical PCK can have an immediate impact on what teachers know and can do. There were significant gains in Geography CK and fewer developments in skills by all participants in the intervention. Gaining CK is all-important as it is a prerequisite for gaining PCK, as also indicated by Rollnick (2017) in her research. She found that the extent of CK of teachers that have to learn to teach an unfamiliar topic determines the teaching strategies they prefer and their learning of CK goes hand in hand with gaining insight into how to teach the topics.

Even if teachers have the skills to teach a lack of CK would severely hamper their transfer of correct knowledge that helps learners understand the subject. Similar findings were made by Lane and Catling (2016). They state that if teachers do not know and understand the subject matter, they will be unable to transfer accurate in-depth knowledge even if they have the skills to teach.

It is therefore, necessary to combine the acquisition of CK with appropriate strategies to teach the content when planning an intervention as

both are required to develop an informed and knowledgeable teaching ability. Mitchell (2018), who suggests that Geography education should always pair content with appropriate pedagogic strategies supports this sentiment. Earlier research by Larson &, Murray (2008) also advocates the inclusion of teaching skills in interventions especially in developing countries.

From the above-mentioned research, it has become clear that we should ask participants what their needs are and investigate their lived experiences so that we can provide them with customised, purposefully designed resources and focused intervention. This view is supported by du Plessis, Gilllies and Carroll (2014) who assert that lived experiences of out-of-field teachers, influence their professional development. Teachers have specific needs related to the content and methodology required to teach an unfamiliar field.

The intervention reported on here made use of OERs purposefully developed for teachers in poor rural under-resourced schools, because they have specific needs and they are low-skilled in teaching the *Earth and Beyond* strand/ Physical Geography of Natural Sciences. This approach is supported by a lesson learnt from impact evaluations of interventions in schools from 56 poor countries namely that '… low-skilled teachers need specific guidance to reach minimally acceptable levels of instruction' (Ganimian & Murnane 2016:179).

The use of OERs that models good teaching practice was valuable for teachers who were oblivious of how certain teaching strategies could be applied in their contexts. In the purposefully designed OERs of this intervention participants were presented with visual examples (videos) of good practice, e.g. how to conduct an experiment or how to do group work effectively. Teachers need such examples to guide them and to avoid resorting to traditional ways of teaching (Reitano & Harte 2016). These researchers assert that good practice should be modelled to help teachers move away from the imprinted observed practices they themselves experienced. This argument is further validated by findings from a study by Lane (2015) showing that teaching as you were taught is a continuing problem in teacher education and teaching practice.

Because the examples of good practice are in the form of visual OER they are always available and can be consulted whenever teachers need guidance on how to utilise OER in the classroom environment. The purposefully designed OER were even more valuable, because they were

designed taking into account the context in which the participants taught. This increases its utilitarian value and furthermore, OER may be useful resources to teachers who find themselves in similar circumstances and have similar needs. Their use can therefore extend way beyond the small intervention undertaken. Ally, Grimus, and Ebner (2014) also emphasise that OER can have long-term benefits and may influence teacher behaviour.

In post-intervention interviews and classroom observations a number of improvements in teaching the *Earth and Beyond* strand were observed, but in practice the impact of the intervention seemed to be still somewhat limited. Some teachers still mostly taught using direct instruction as teaching strategy, some relied mostly on only textbooks as resources and only some classrooms changed for the better. In other words, there were some positive indications of sustained improved practice in the teaching of the *Earth and Beyond* strand, but not for all participants.

Research of a similar nature and context on the impact of interventions (Haßler, Hennessy, Cross, Chileshe & Machiko 2015; Hennessy, Haßler & Hofmann 2016) also indicated gains in knowledge and positive changes in teaching strategies used by teachers after the intervention. There was however, no longitudinal study in these cases to find out if teachers maintained these practices or permanently changed their teaching approach.

The three OER units including videos (one on group work and one on an experiment to indicate how clouds form) and photos of geographical landforms were found to be very useful by teachers as they could see how teachers and learners in a real classroom environment could teach and learn effectively.

Some teachers reported using the intervention activities because they now:

- knew how to do them as they observed them being done in a real situation (on video);
- could make use of some of the technology suggested to vary their teaching and make it more interesting;
- were confident that they could do the activities with learners (and could fall back on the videos or photos if needed);
- could make use of them because it required very few and easily accessible resources (most of them waste materials);

- could teach things in their out of field subject/out of speciality strand which they could not do before;
- could construct teaching materials which they did not know how to do before (there was a step-by-step guide with photographs and a video).

The use of OER therefore contributed to the deepening of knowledge and skills of the teachers. Some teachers also reported that where they loathed doing it before, they now enjoyed teaching the *Earth and Beyond* strand as they felt more knowledgeable, prepared and confident. They furthermore noticed geographical things all around them which they were not aware of before. Because of this they also knew more about their local area and could use examples from it that made more sense to learners. They obviously became and felt more able to teach the *Earth and Beyond* strand.

What also emerged was that teachers could use the activities involving the OER (which is conducive to learning) but did not go beyond that and developed their own activities based on the knowledge and skills they acquired. They seemed to still feel that they did not know enough and did not feel confident enough to try doing something new on their own. They were of the opinion that further focused interventions could help them to eventually design and develop their own learning activities.

## 8 Recommendations

Because the research was limited to twenty teachers it is recommended that more of the same or similar research should be replicated to gain more insights and a larger base of knowledge on which interventions can be planned and undertaken. It is also recommended that OER purposefully developed to be used in focused interventions to improve teacher knowledge and teaching skills should be included in interventions to assist not only the teachers that were part of the research but also other out of field/out of specialisation teachers teaching the *Earth and Beyond* strand. The Department of Basic Education could play a major role in making OER available to facilitators of training workshops for Natural Science teachers. This can be done in partnerships with institutions (such as universities) which can assist in the development of the OER.

The theory of change used for this research has to be revisited, as the desired changes were not all completely achieved by it. The intervention

achieved some very positive short-term outcomes in terms of the increase in knowledge and skills in Geography. The intended long-term outcome of a change in teaching strategies however fell somewhat short of its target as only some of the participants sustained their use of strategies aimed at greater learner participation and active learning. Participants indicated that aftercare or continued school-based support might see more sustained changes in teaching strategies. Interventionists should take note of this when they plan future interventions.

The spiral model of using four interventions spread over a two year period had some benefits but it seems as if another spiral or two (aftercare in the form of continued contact with participants and additional school-based support) may have had an even bigger impact. Future interventions may draw on these findings when planning their actions.

## 9. Conclusions

OER that include visual images such as videos and examples of activities such as doing group work and experiments can have an impact on the PCK of teachers. An intervention employing OER as described in the article can have an immediate impact on the Geography knowledge and skills of teachers but the long-term changes of teaching practice to a more learner oriented, active learning approach still seems to be somewhat limited. It also does not seem to enable some teachers to develop and design their own activities or to significantly change their classrooms or expand their repertoire of teaching strategies. If interventions can be followed up by school-based support and/or follow-up interventions to strengthen the gains or build on them, the impact may be more sustainable.

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# Lessons for GIS Implementation in Zimbabwe from the South African Experiences

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## Abstract

In recent years Geography Information System (GIS) implementation in schools has emerged as one of the most important threads deserving academic inquiry globally. This paper seeks to draw lessons from the South African experience on GIS implementation by engaging in an in-depth documentary analysis of the Geography syllabus in the updated Zimbabwe curriculum and the South Africa (SA) Curriculum and Assessment Policy Statement (CAPS) Geography syllabus. This paper draws from the Normalisation Process Theory (2009) and the Extended Normalisation Process Theory (2013). The researcher purposively selected the Ordinary Level Geography Syllabus in Zimbabwe and CAPS Geography Syllabus Grade 10 - 12. This paper argues that there are numerous lessons that Zimbabwe can draw from South African experiences. Among the lessons that can be drawn from the CAPS Geography syllabus are the following; the fusion of GIS across Geography topics instead of taking GIS as a standalone topic; allocating adequate financial resources to schools, allocating GIS more time in the syllabus among others. The researcher recommends that Zimbabwe adopt a paper-based GIS educational package.

**Keywords:** Geography Information System, updated Zimbabwe curriculum, Curriculum and Assessment Policy Statement

## Introduction

This paper on GIS implementation in schools draws lessons from the South African experience by engaging in an in-depth documentary analysis of the


Print ISSN 1023-1757; Electronic ISSN: 2519-5476; DOI https://doi.org/10.29086/2519-5476/2018/sp21a9

Geography syllabus in the updated Zimbabwe curriculum and Curriculum and Assessment Policy Statement (CAPS) Geography syllabus. For comparative purposes, the researcher purposively selected the Ordinary Level Geography Syllabus in Zimbabwe and CAPS Geography Syllabus Grade 10 - 12. A number of studies (Drew, 2012; Dardagan, 2013; Jansen, 2017) have offered comparisons of the Zimbabwean and South African education system. However, it can be noted from these studies that there is no comparison of the Geography syllabi in schools in Zimbabwe and South Africa as pursued in this paper. Drew (2012) states that the education systems in Zimbabwe and South Africa allow for comparability due to a number of reasons. Zimbabwe and South Africa's shared colonial history has implications on the present-day education systems of the two countries. The most glaring similarity in the education arena is that both countries inherited racially skewed education systems. The majority black population were denied educational opportunities in both countries. However, tremendous efforts to redress the colonial legacy in the education system in the post-independence era were witnessed in both countries albeit with varying implications. Efforts have also been exerted to modernise the education sector through curriculum change. One of these changes has been the introduction of GIS into the Geography curriculum in both SA and Zimbabwe.

## What is GIS?

GIS is a product of the computer revolution which entailed the computerisation of various sectors of the economy. Palladino (1994:04) reveals that, 'Geographic information systems are an outgrowth of the computer revolution, as automated versions of the age-old activity of analysing our surroundings'. Ozgen (2009:1879) states, 'A Geographic Information System (GIS) is a high performance computer-aided chain of software which enables us to understand, interpret, capture, update, map, and display natural and human-originated events on Earth and allows us to bring out such phenomena in a form of synthesis'. Whereas, Burrough (1986:06) avers that GIS is 'a powerful set of tools for collecting, storing, retrieving at will, transforming, and displaying spatial data from the real world for a particular set of purposes'. Thus, GIS is a computer-based platform that integrates a multiplicity of data sets to digitally represent and analyse the geographic features present on the Earth' surface and

the events. In addition, GIS typically comprises hardware, software, geographic data, and personnel designed to manipulate geographically referenced information in order to achieve a stated objective (Breetzke, Eksteen & Pretorious 2011:02). According to Whitaker (2011:52), 'GIS software is the tool that sets the stage for teachers to use GIS to build inquiry, 'hands-on, minds-on' lessons and projects that are correlated to specific content objectives'. Hence, GIS can be viewed as a tool aiding analysis of the Earth's surface and events in Geography.

## Curriculum Change in Zimbabwe and South Africa

Curriculum change in both countries introduced GIS in Geography as stated above. In Zimbabwe GIS is now being taught from Form One to Form Six (Curriculum Development Unit 2015) whilst in South Africa, GIS is covered in the curriculum from Grade 10 to 12. The paper focuses on GIS implementation from Form One to Four in Zimbabwe and Grade 10 to 12 in South Africa. An interrogation of GIS implementation in Zimbabwe by drawing lessons from South African experiences is proffered through a documentary analysis of the available curricula and empirical research that have been published. The paper starts by providing a background to GIS implementation in Zimbabwe. The next section introduces to the reader to the concept of GIS as well as selected literature from around the world on GIS implementation to provide a foundation for understanding GIS implementation in Geography world-wide. The researcher proceeds to present the research methodology and then finally presents the themes around GIS implementation in Zimbabwe from South African experiences. The paper finally presents some valuable concluding remarks from the discussion.

## Background to GIS Implementation in Zimbabwean Schools

GIS implementation in Zimbabwean schools was introduced as part of the updated Zimbabwean curriculum in 2017. The introduction of an updated curriculum in Zimbabwe brought numerous changes in the syllabi in secondary education in general and Geography in particular (Curriculum Development Unit 2015). The government of Zimbabwe in 2015 initiated a curriculum review process with the aim to enhance the school curriculum against the

backdrop of the Presidential Commission of Enquiry into Education and Training Report (Nziramasanga 1999). Various stakeholders participated in the curriculum review process across the country. Learners, parents, teachers, leaders in industry, academia, media among others participated in the curriculum review process. Thus, numerous recommendations were made by stakeholders during the review process which culminated in the inclusion of new concepts and teaching approaches in the curriculum (Ministry of Primary and Secondary Education 2015b). The need to innovate and integrate Information Communication and Technology in the education sector was among the recommendations made by the stakeholders (Ministry of Primary and Secondary Education 2015b). Among the notable changes introduced by the updated curriculum in Zimbabwe was the introduction of Geographic Information Systems (GIS) in secondary education. Other notable changes brought about by the updated curriculum which have a bearing on Geography teaching include the introduction of continuous assessment and emphasis on practical lessons as opposed to theoretical lessons. Conversely, this paper focuses on the lessons from South Africa that can be learnt in GIS implementtation.

Notwithstanding the acknowledgement and advocacy by geographers around the world on the importance of GIS in secondary education (Kerski 2003; Lam, Lai & Wong 2009), Zimbabwe has been lagging behind in GIS implementation as reflected by its glaring absence from the schools prior to the updated curriculum. The position adopted by the Zimbabwe government on GIS implementation is supported by scholars, Gardner and Lambert (2007) who argue that 'the curriculum needs to provide opportunities for pupils to use varied resources, including maps, visual media and Geographical Information Systems' (Gardner & Lambert 2007:07). GIS prior to the adoption of the updated curriculum in Zimbabwe was only being introduced at tertiary level, which is at teachers' colleges and universities. Thus, student-teachers and undergraduates were introduced to GIS without any prior exposure to the sub discipline at secondary school level. The new secondary school Geography syllabus which was introduced in Zimbabwe states that learners should 'demonstrate basic knowledge of geographic information systems (GIS) in resource management' (Curriculum Development Unit 2015:01). Therefore, this article was premised on examining the challenges availed by the implementation of GIS in secondary schools in Zimbabwe. The challenges are discussed in the light of South African experiences in GIS implementation.

## GIS Implementation Abroad

A number of studies have been carried around the world on the implementation of GIS in secondary education. In a study in the US secondary schools, Kerski (2003) established that GIS was peripheral in the secondary school education and that there were fewer GIS-based modules. Therefore, it can be noted from Kerski's study that GIS implementation in USA was still in its infancy as only 1 % of the high schools are now using GIS technology. In addition, Kerski's study further noted that lesser than 5 % of all US secondary schools owned GIS software. In another study in Hong Kong, Lam *et al.* (2009) revealed that the level of use of GIS in secondary education was low despite the availability of the essential hardware and software in schools. Thus, it can be argued that GIS implementation in schools takes more than just the availability of essential hardware and software. Availability of hardware and software are prerequisite but other factors such as time allocation and teacher competency also need to be available. A study by Komlenović, Manić and Malinić (2013) in Serbia noted that GIS is not yet fully utilised in secondary education. The study by Komlenović *et al.* (2013) further note that the use of GIS was theoretical as teacher presentation was the dominant method. These studies reviewed above can be argued to have been carried out in countries in the north, thus it becomes imperative that studies in the south on GIS are carried out to fill the gap in the literature. There are studies on the implementation of GIS in South Africa (Breetzke *et al.* 2011; Chisholm, Hoadley, wa Kivulu, Broakes, Prinsloo, Kgobe, Mosia, Narsee & Rule 2005; Marais 2016). Therefore, there was a need for another study on GIS implementation in a country that shares historical and educational realities with Zimbabwe. Hence, this paper focusing on GIS in Zimbabwe on the adoption of GIS in secondary education drawing lessons from South African GIS implementation experience.

## Theoretical Framework

This paper on the lessons on GIS implementation in Zimbabwe drawn from the South African case study is guided by the Normalisation Process Theory (2009) and the Extended Normalization Process Theory (2013). The Normalization Process Theory is an implementation theory seeking to appreciate and unpack certain aspects of implementation of policy or intervention. The researcher views GIS implementation as an intervention

aimed at enhancing Geography teaching and learning in Zimbabwe and South Africa. May and Finch (2009) reveal that the Normalisation Process Theory articulates factors that facilitate and obstruct the integration of complex interventions into everyday practice. Additionally, the Normalisation Process Theory has four main components; coherence, cognitive participation, collective action and reflexive monitoring (Hooker, Small, Humphreys, Hegarty & Taft 2015; May & Finch 2009). Therefore, the Normalisation Process Theory in this paper guides sense-making of GIS and engagement of stakeholders in GIS implementation. Furthermore, the Normalisation Process Theory states that the 'drivers of change include individual, organisational, political and economic factors' (Grol & Wensing 2004: 13). The Extended Normalisation Process Theory seeks 'to provide a more comprehensive explanation of the constituents of implementation processes' (May 2013: 1). Additionally, according to the Extended Normalisation Process Theory (2013) implementation of intervention comprises practitioners who interact with each other and with intervention components and the implementation contexts. Hence, the researcher draws from the Normalisation Process Theory (2009) the benefits and costs of an intervention. Whereas, from the Extended Normalisation Process Theory, the researcher is guided on role of the practitioners in the implementation process.

## Research Methodology

The data for this paper encapsulates the lessons on GIS implementation in Zimbabwe that can be drawn from the South African case study. Stake (1995) identifies three types of cases which are dependent on the purpose of inquiry; 'an instrumental case study is used to provide insight into an issue; an intrinsic case study is undertaken to gain a deeper understanding of the case. The collective case study is the study of a number of cases in order to inquire into a particular phenomenon' (Zucker 2009: 3). Thus, the South African case was selected as an instrumental case into GIS implementation in schools in Zimbabwe. I utilised documentary analysis. Bowen (2009) avers that document analysis entails researcher giving an expression and import to documents. Documentary analysis has three primary types; public records, personal documents and physical evidence (O'Leary 2014). In this paper, the researcher utilised public documents; studies carried out in South Africa on

GIS implementation, the South African National Curriculum and Assessment Policy Statement (CAPS) Geography syllabus Grade 10 - 12 and the Zimbabwean Geography Syllabus Forms 1 - 4. The study was confined to a documentary analysis of public documents as Bowen (2009) argues that document analysis focuses on quality rather than quantity. Emerging themes from the documentary analysis on lessons drawn from the South African experience were identified and is articulated below.

## Lessons from Studies on GIS Implementation in South Africa

The National Curriculum Statement (NCS) for Grades 10 - 12 introduced GIS into South African schools as part of the Geography curriculum from 2006 - 2008 (Breetzke *et al*. 2011) The implementation of CAPS further treasured the place of GIS in the South African geography curriculum. Whereas, in Zimbabwe, GIS was only introduced in 2017 as part of the updated Zimbabwean school curriculum. It can thus be noted that South Africa has been teaching GIS for more than a decade. Therefore, it follows that South African experiences can avail invaluable lessons to the Zimbabwean education system. Breetzke *et al.* (2011: 3) reveal, 'Anecdotal evidence suggests that the recent introduction of GIS in schools in South Africa has been problematic'. Hence, the researcher seeks to draw lessons from the problems encountered by South African schools in the introduction of GIS.

## Financial Constraints in GIS Implementation

A growing thread on the GIS implementation in South Africa argues that the introduction of GIS was curtailed by financial constraints. Among scholars who contributed to this growing thread are Zuma (2016), Breetzke *et al.* (2011) and Nxele (2007). A study by Zuma (2016) found that lack of funding from the Department of Education hindered GIS implementation in the uMhlathuze Circuit. Nxele (2007) avers that there is lack of funding in schools which adversely affects GIS implementation. Funding is instrumental in GIS implementation in schools as it has a bearing on the schools' ability to procure hardware and software. Breetzke *et al.* (2011: 7) elaborate, 'The introduction of computerized GIS in any schooling system requires considerable financial input in terms of purchasing the necessary software, hardware, and educational

materials as well as money for the training of educators'. Essential for this paper is that successful GIS implementation in schools is hinged on financial input from the stakeholders. Therefore, it can be argued from the lesson here drawn from the South African case study is that GIS implementation in schools requires substantial funding. Despite an acknowledgement by this researcher that the Zimbabwean curriculum by adopting GIS is heading in the right direction, it should be noted that there is a need for adequate funding. In addition, an innovation in the nature of GIS implementation in schools requires an increase in the financial resources allocation.

## Lack of Electricity

Anecdotal evidence emerging from studies on GIS implementation in South African schools also reveal that lack of electricity in some schools is another challenge to GIS implementation. A study by Nxele (2007) found that 41 % of the schools in Eastern Cape do not have electricity. Rural schools are the most affected by lack of electricity due to the fact that they are located in communities which are still lagging behind in development. This is in spite of the South African Schools Act (SASA) of 1996 stipulating that each school should have electricity among other prerequisite infrastructure. Thus, it can be argued that GIS implementation in South Africa was curtailed by the lack of electricity in some schools. Resultantly, there was no uniform GIS implementation throughout the country as schools without electricity were lagging behind. Therefore, an important lesson that can be drawn from the South African experience is that GIS implementation can be affected by lack of electricity. In order for GIS implementation to be successful in Zimbabwe, the relevant authorities should strive to electrify all schools. Tarisayi (2010) revealed that ICT integration in Masvingo district was hampered by lack of electricity among other issues. Another study by Konyana and Konyana (2013) found that computerization in rural schools in Zimbabwe was hampered by lack of electricity. Therefore, it remains to be seen how the Zimbabwean schools are going to implement GIS uniformly against a background of lack of electricity in most rural schools. The realisation of the magnitude of challenges posed on GIS implementation by a lack of electricity led geographers and scholars in South Africa to consider a paper based GIS educational package. Breetkze *et al.* (2011) recommend a paper-based GIS as a practical solution to overcome GIS implementation challenges in South Africa. Therefore, the

researcher argues that another important lesson on GIS implementation from the South African experience is adopting a paper-based GIS. A paper-based GIS has the advantage of being suitable for resource constrained schools in developing countries like South Africa and Zimbabwe.

## Time Allocation

The time allocation for GIS in Geography lessons has also been identified as a challenge to GIS implementation by scholars (Breetzke *et al.* 2011). Time constraints in the teaching of GIS in South Africa stems from the CAPS allocation of only four hours per week to teaching Geography. Resultantly it can be argued that Geography as an elective in the CAPS curriculum has been allocated inadequate time. Therefore, the teaching of GIS becomes theoretical without any exposure to the technical and practical aspects of GIS which is time consuming. Furthermore, time constraints also have implications on staff development as Geography teachers lack the time to attend GIS workshops and training (Breetzke *et al.*, 2011). Hence, as Zimbabwe innovates and introduces GIS there is need to circumspect and introspect on the time needed for both teaching GIS and staff developing of teachers to be competent in their teaching of GIS as it is a new sub discipline of Geography and teachers have not had exposure to it in their preservice training. The updated Zimbabwean Geography syllabus allocates only five lessons per week which translates to three hours and twenty minutes. Hence, the time allocated to Geography in the Zimbabwean updated curriculum based on lessons from South African experience can be argued to be inadequate. The South African experience indicates that GIS implementation in schools was curtailed by time constraints and therefore it follows that the same scenario is bound to happen in Zimbabwe. The researcher poses the question; If South Africa had challenges working with four hours per week, what are the implications of Zimbabwe's allocation of three hours and twenty minutes? Thus, time allocated to the teaching of Geography will become a stumbling block in GIS implementation as revealed by lessons from South African experiences. Hence, the researcher argues that there is need to address the time allocation for the teaching of GIS in Geography in both countries, it appears.

## Class Size

Studies on GIS implementation in South Africa also reveal that class sizes are

another hindrance. In terms of South African education policy, learner: educator ratios are pegged at 1:40 for primary schools and 1:35 for secondary schools. A study by Marais (2016) revealed that South African schools are overcrowded. In addition, Chisholm *et al.* (2005: 20) elaborate,

> Large classes impact on workload, in so far as the assessment, recording and reporting and other requirements are increased manifold – the result is that educators with large classes spend more time on discipline and related issues than on meeting the requirements, which become well-nigh impossible in contexts with limited resources.

Implementing GIS in such an overcrowded learning environment becomes a daunting task for the Geography teacher. Thus, it can therefore be reasoned that GIS implementation in South African schools is adversely affected by large class sizes to a great extent. GIS lessons requires a development of practical skills as opposed to theoretical approaches which are suitable for large class size. Hence, it can be argued from lessons drawn from the South African experience that GIS implementation requires an optimum class size. The challenge of class size can be addressed through long terms measures such as the construction of more schools and employing more teachers. Employing more teachers will address the teacher: pupil ratio (the current teacher: pupil ratio is at 1:50 in Zimbabwe according to Ministry of Primary and Secondary Education 2015a) while constructing more schools will address overcrowding in classrooms.

## Lessons Drawn from the CAPS Geography Grade 10 - 12 Syllabus in South Africa

This section analyses lessons that can be drawn the CAPS Geography Grade 10 - 12 syllabus in South Africa. The lessons that are analysed in this section are legal framework, political will, aims of the syllabus, integration of GIS and elective status of Geography.

## Legal Framework

Curriculum change requires a supporting legal framework. A crucial lesson on GIS implementation from the South African experience is on the role played

by a supportive legal framework. The researcher noted that the CAPS adoption in South African schools is within the legal framework. The CAPS implementation is supported by the South African constitution as well as the South African Schools Act (SASA) of 1996. Hence, the researcher argues that any innovation of the magnitude of GIS implementation in schools requires a supporting legal framework as revealed by the South African experiences. Therefore, it follows that it is imperative that the Zimbabwean education system ensure that there is a supportive legal framework to enhance GIS implementation. A supportive legal framework is crucial in ensuring that there is government support and funding in the rollout of GIS implementation. The above section argued that GIS implementation in South Africa was curtailed by lack of financial resources and electricity. These challenges can be addressed through adherence to the legal framework (South African Schools Act (SASA) of 1996) which stipulates that all schools should have electricity. In addition, the legal framework also specifies the role and contribution of each and every stakeholder in the funding of educational innovations such as GIS implementation to a greater extent.

## Political Will

Another important lesson from the South African experience which was noted is that educational programmes in general and GIS implementation in schools particular requires political will. Most of the challenges already discussed in the earlier sections can be overcome with a strong political will. The political will necessary for the success of GIS implementation is aptly summed by the current South African Minister of Basic Education Angie Motshekga;

> Curriculum reform is not something that the system takes lightly. My message from the onset of the curriculum review process has been that we need to work against change fatigue in order to build confidence and enthusiasm amongst all our stakeholders. Therefore, we are proceeding deliberately and decisively to effect the broad recommenddations of the Ministerial Committee. At the same time, we need to deal quickly and efficiently with curriculum implementation challenges and difficulties that do exist (Motshekga 2010).

Thus, according to the South Africa minister of Basic Education, curriculum

reform is prioritized by her ministry. Additionally, Motshekga warns against curriculum review fatigue as it was a long and demanding process. It can thus be argued that GIS implementation in schools in South Africa was carried out with the support of the minister and the government in its totality. Hence, the researcher's argument that one important lesson that can be drawn on GIS implementation from South Africa experience is the role played by political will. Therefore, any discussion on the challenges faced in GIS implementation in schools in South Africa calls for an appreciation of the contribution of political will. It can thus be argued further that for Zimbabwe to succeed in avoiding the pitfalls encountered in South Africa there should be political will, a commitment by government to ensure the success of a new curriculum innovation in the curriculum.

## Aims of the Syllabus

Another essential lesson that can be drawn from the South African experience pertains to aims of the syllabus. The Zimbabwean Updated Geography Syllabus (2016:01) states that learners should 'demonstrate basic knowledge of geographic information systems (GIS) in resource management'. Whereas, the CAPS Curriculum (Grade 10 - 12) states, 'promoting the use of new technologies, such as Information Communication Technology (ICT) and Geographical Information Systems (GIS)'. The CAPS policy document is clear in terms of its GIS objective as compared to the Zimbabwean updated curriculum. The objective of the CAPS Curriculum clearly shows that there is indeed a commitment towards GIS implementation in South Africa schools. In addition, a comparison of the two aims reveals that South Africa pursues practical use of GIS while Zimbabwe is still striving for theoretical knowledge of GIS. Hence, there is a need to realign the aims of The Zimbabwean Geography syllabus towards promotion of the use of new technologies.

## Integration of GIS

The documentary analysis further revealed disparities in the approaches in GIS implementation in South Africa and Zimbabwe. In the CAPS Curriculum Grade 10 - 12 Geography syllabus, GIS is not taught as a standalone topic but is supposed to be included and applied in various topics. For example, GIS is

applied in every topic at Grade 12 while for Grade 10 it is applied to the topic on water resources and at Grade 11 it is applied to resources and sustainability. Therefore, it can be argued that by the end of the Geography course from Grade 10 up to Grade 12, GIS would have been applied to all topics. However, in the Zimbabwean Geography syllabus there is a different approach altogether whereby GIS is taught as a standalone topic from Form 1 - 4. GIS is not integrated in the Zimbabwe Geography curriculum into each of the themes but is introduced as a separate topic. In addition, GIS in the Zimbabwean Geography syllabus comes at the end of the curriculum. The Zimbabwean approach to GIS implementation can be argued to relegate GIS to an addendum. Teachers can avoid teaching GIS in the Zimbabwe scenario because it comes at the end of the curriculum and it is also a standalone topic. Thus, an important lesson on GIS implementation that can be drawn from the South African experience is on the need to integrate GIS in all topics in Geography. An appreciation of GIS can only be made possible if learners are constantly being taught GIS concepts throughout their Geography curriculum. Reserving GIS to one standalone topic can be argued to be demeaning its purported contribution to Geography. Furthermore, some teachers may opt not to teach GIS if it is not integrated into other topics in the syllabus.

## Elective Status of Geography

The documentary study also noted that Geography is an elective in both countries. In Zimbabwe, prior to the introduction of the updated Zimbabwe curriculum Geography was a compulsory subject. However, it was downgraded to an elective status in the updated curriculum. Geography is also an elective in the South Africa CAPS curriculum. Some of the challenges faced in South African schools already discussed in detail above are attributable to the subject's elective status. For instance, studies by Nxele (2007) and Zuma (2016) all established that GIS implementation was curtailed by a lack of funding. In addition, another study by Breetzke *et al.* (2011) indicated that time constraints affected GIS implementation in South Africa. Lack of funding and time constraints can all be associated with the elective status of Geography in the curriculum as a subject. Thus, the updated Zimbabwean curriculum can be argued to have the following outcome best explained with the idiom: 'given with one hand and taken away with the other'. The inclusion of GIS in the

updated curriculum was welcome. However, making Geography an elective is not good for the subject as it leads to attitudinal problems from the learners and administrators. West (2009) opines that GIS implementation is curtailed by student negative attitudes. GIS implementation will therefore suffer from negative attitudes from administrators due to its financial demands. Resultantly, it can be argued that administrators would rather promote other subjects which have less financial demands as compared to Geography. Hence, it can be argued that strides likely to be accomplished by the inclusion of GIS in Geography are likely to be reversed by the change in the status of the subject. The downgrading of the status of Geography to an elective has ramifications for resource allocation and timetabling. Less financial and material resources are allocated electives in schools as shown in the South African experience. Thus, Geography has fallen victim to its new elective status which means less resource allocations. Hence, it can be argued that while the inclusion of GIS in the updated Zimbabwean curriculum is applauded, downgrading of the status of the subject to an elective is mourned to a greater extent. The likely benefits of the enhancement of the Geography syllabus in Zimbabwe will be eroded by the elective status now accorded to the subject to a greater extent. Therefore, the fact that Geography has an elective status in the curriculum has far reaching implications in GIS implementation in Zimbabwe. The South African experience indicate that a lack of funding and time allocation issues currently inhibits GIS implementation and can be resolved through making the subject compulsory. The status of a learning area in the curriculum ultimately has a bearing on the funds allocated towards the teaching of that particular learning area. Therefore, the researcher argues that a compulsory status for Geography will justify the time and resource investment in the subject in general and GIS in particular to a greater extent in Zimbabwe.

## Concluding Remarks

In summary, this article examined the lessons that can be drawn on GIS implementation for Zimbabwe from the South African experiences. The findings indicated that GIS implementation in South Africa was curtailed by a multiplicity of challenges. The greatest challenge to GIS implementation as revealed by this article was a lack of funding. A lack of funding can be concluded to have an overarching bearing on other challenges which militate

against GIS implementation. The researcher concludes that lack of funding feeds into other challenges such as class size and lack of electricity. Addressing the issue of funding in schools will arguably positively impact on provision of more infrastructure which in turn reduces class size. The article further established that GIS implementation was also affected by time allocation. The allocated four hours are not adequate to ensure sufficient coverage of GIS in Geography lessons. It was further noted that GIS needs to be integrated into Geography topics (as in South Africa) instead of being taught as a separate subject (as in the Zimbabwean approach). The article recommends that Geography as a learning area should be made compulsory. The researcher noted that in both countries Geography is offered as an elective. Thus, it can be argued that lack of funding and time allocation challenges can be addressed through a change in the elective status of Geography. Learning areas which are compulsory enjoy a bigger allocation of resources by schools and stakeholders. Additionally, the article established that GIS implementation in schools was affected by lack of electricity in some schools especially rural schools. The electricity challenge can be addressed through provision of alternative power sources such as solar energy to schools which are located away from the power grid. In view of the above discussed GIS implementation challenges, the author recommends the adoption of a paper-based GIS in schools in Zimbabwe. Despite the challenges highlighted in this article, the inclusion of GIS in the Geography syllabi in both Zimbabwe and South Africa is applauded for keeping up with the latest technological advancements worldwide.

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# Determinants of Food Insecurity amongst Primary School Children through the Lens of Affected Parents and Teachers: The Case of Matobo District, Zimbabwe

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## Abstract

Children from food insecure households tend to be vulnerable to diseases and miss school or fail to participate in school activities. This paper reports on the determinants of food insecurity amongst primary school children in southwestern Zimbabwe, a context where inadequate data presently exists. According to Chattopadhay (2000: 312), an explanation for Zimbabwe's food insecurity can be understood using the entitlement framework by Amartya Sen (1981). Qualitative research using a case study research design was used. School administrators, teachers and parents of food insecure children were purposively selected. The tools were semi-structured interviews (28 in total) and focus group discussions (14 in total for the six schools that were sampled). The results show that the determinants of food insecurity amongst primary school children in Matobo district are multifaceted: social, economic and environmental and they tend to compound each other. Most households are vulnerable to food insecurity as a result of a loss or lack of physical, social, financial, natural and human assets. Additionally, poverty and climate change seem to be the major contributors of food insecurity in rural areas. The paper concludes by asserting that government can ensure food security in southern Zimbabwe by reviving existing irrigation schemes and supporting income generating projects at household level through training and the provision of start-up capital. There is also the need for non-governmental organizations to


Print ISSN 1023-1757; Electronic ISSN: 2519-5476; DOI https://doi.org/10.29086/2519-5476/2018/sp21a10

empower the local residents of Matobo district on the available options to germinate livelihood success and thus ensure future food security for their families.

**Keywords:** Food insecurity, climate change, climate variability, vulnerability, resilience, livelihoods and food aid

## Introduction

When food insecurity related disasters, such as droughts strike, children are the most affected by experiencing limited access to enough, safe and nutritious food for an active and healthy life (Manyena, Fordham & Collins 2008). Children from food insecure households are likely to have diets lower in some core foods, such as fruit, vegetables and lean meat (Ramsey, Giskes, Turrell, & Gallegos 2011) and tend to be vulnerable to diseases and miss school or fail to participate in school activities. Many of the households in Southern Africa struggle to feed their families due to poverty and an over reliance on climate-sensitive livelihoods such as agriculture and natural resources (Murungweni *et al.* 2014).

Scholes and Biggs (2004) asserted that food insecurity is one element in a cycle of entrenched socio-economic frailty, marked by unemployment, isolation from markets, and lack of education, poverty and vulnerability. Therefore, food insecurity results from a complex interaction of multiple stressors (Connolly-Boutin & Suit 2015). Amartya Sen noted in the early 1980s that people often fall prey to food insecurity not because food is unavailable on the market but rather because they have limited access (entitlements-failure) to such food caused by poverty (Legwegoh & Fraser 2015). The poor lack of income results in the inability to access food or to buy inputs for food production. This implies that food insecurity affects those who do not have the means to buy food. Food insecurity is a function of entitlements and not food availability as such (Sen 1981). The poorest populations are normally found in marginal areas that are sensitive to climate change and they tend to rely on climate-sensitive livelihoods. People living in geographically disadvantaged regions are more likely to face unemployment, or have a low income and experience financial problems as a result of a combination of environmental

and structural barriers (Lê, Auckland, Nguyen, Murray, Long & Terry 2015). For households to be food secure they need to possess assets essential to their livelihood strategies, that is, human capital, natural capital, financial capital, social capital and physical capital (Matshe 2009).

## Drivers of Food Insecurity in Zimbabwe

In this section, food insecurity is linked to urbanization, social stratification as well as its impacts on childhood development. These focuses are needed, as they are seminal in the context of the study upon which this paper is based.

### *Urbanization and Rurality's Link to Poverty*

A central argument is that development favours urban areas as economic elites garner political power in the cities and formulate policy to their advantage leaving rural areas undeveloped (Scanlan 2003:103). Urban areas are the core regions and rural areas are the periphery regions. All the resources, some coming from the periphery, are channeled towards the development of the core. This policy favours economic investment in urban areas and disfavours the rural agrarian lifestyle (Scanlan 2003). Rural areas remain underdeveloped and they are engulfed by poverty, which leads to food insecurity. According to Scanlan (2003:103) state commodity boards purchase agricultural products from farmers at artificially low costs and export it for profit, this is a practice to redistribute wealth from the poor rural sector to the cities. Those who produce food are the least able to afford it and are the most likely candidates for hunger from the poverty created by urban bias (Scanlan 2003:103). Uneven distribution of wealth causes underdevelopment, poverty and food insecurity in rural areas.

The road network in Zimbabwe is undeveloped especially in rural areas. Access to markets and utilities is constrained by a lack of infrastructure and prohibitive high-transport costs (Haile 2005:2172). It is very expensive for farmers to access agricultural inputs such as seeds and fertilisers and this compromises production and farmers cannot get their produce to markets at a competitive price due to high transport costs (Haile 2005:2173). It has been observed that access to markets is particularly important for food security since the ability to purchase food is also a major factor in ensuring food security

(Sunderland 2011:269). Food insecurity in rural areas is also attributable to a lack of appropriate storage facilities. High post-harvest agricultural losses are experienced due to poor storage facilities thereby affecting food stability. All these contribute to the underdevelopment of rural areas.

## *Social Stratification*

Society is stratified into various classes and this leads to uneven distribution of resources and marginalized groups are affected by food insecurity. Poor people are highly affected by food insecurity as they lack resources to access food. Absolute poverty in particular is a primary indicator of food insecurity (FAO 1999 cited by Scanlan 2003:104). Most societies in sub-Saharan Africa are patriarchal. Additionally, women and girls are discriminated against and fail to access food leading to malnutrition and related health problems (Bennett 1987; Charlton 1984 cited by Scanlan 2003).

The Zimbabwean culture is also patriarchal in nature and it discriminates against women in terms of employment and access to entitlements such as land. Paid off-farm activities are a form of entitlement, however, men and women have differential access (Kerr 2005). According to Kerr (2005:63) women have fewer options for earning off-farm cash income due to employer bias, low education and household duties and some men who are involved in off-farm jobs do not send regular remittances back home. However, women are the most involved in food production, processing, preparation and childcare responsibilities. Economically, women's dependency on men, their unequal access to resources, opportunities and assets, including land, often places them at high risk of HIV/AIDS infection (Gillespie & Kadiyala 2005:1283). Women and girls make up almost 57% of all people infected with HIV in sub-Saharan Africa and 76% of young people (aged 15 - 24 years) living with HIV are female (UNAIDS cited by Gillespie & Kadiyala 2005:1283).

HIV/AIDS is a scourge in sub-Saharan Africa and the highest global rates of HIV infection and AIDS related deaths are in Africa, especially in southern Africa (Hamid 1994:255). Research has found that the poor and orphans tend to engage in unsafe sexual behaviours (Mkhonta 2018) and end up contracting HIV/AIDS. The poor despite knowing of the risks, were found to continue engaging in high-risk behaviours, such as seasonal migration

(Gillespie & Kadiyala 2005:1284).According to *Ansell et al.* (2009:194) it was observed that in Lesotho, Malawi, Zambia and Zimbabwe HIV/AIDS is the underlying cause of food insecurity. It affects human capital by incapacitating adults to engage in manual labour and to work for money thereby affecting the purchasing power and monetary resources are diverted towards medical care and funerals (Ansell *et al.* 2009).

The poor are the most vulnerable to climate change because they do not have access to weather forecasts (Musemwa *et al.* 2015). Wealthier households tend to be more resilient to droughts because they have access to weather forecasts whilst subsistence farmers are the most affected by short-lived droughts even if average rains are good (Mertz *et al.* 2009). The major off-farm activity in the study area is vending. Most of the households buy vegetables from irrigation farms and also harvest wild fruits to sell at shopping centres. This informal sector is already saturated and the changing and escalating prices are increasingly exposing most households to vulnerability (Hamid 1994).

## *Food Insecurity and Childhood*

Household food insecurity has experienced a precipitous rise amongst the low income population who are more vulnerable to the health and environmental risks posed by socioeconomic and physical factors (Nord, Margaret & Steven 2006). This has precipitated nutrition problems and health issues amongst children due to increased hunger and their insufficient access to nutritious food, leading to low academic achievements.

Given that childhood is a unique development period when an individual's main physical, mental, emotional and social development takes place (Manyena *et al.* 2008) it is surprising that in the existing literature there is a grey area on the determinants of food insecurity in sub-Saharan Africa. The literature written by Western scientists and policy makers contain a consistent narrative that sub-Saharan Africa is facing food insecurity due to climate change and population growth whilst in the African literature food insecurity is due to poverty problems linked with limited access and poor economic conditions (Legwegoh & Fraser 2015). Sub-Saharan Africa is the poorest region and food insecurity is rife, thereby affecting child development. Food insecurity amongst primary school children may result in sub-optimal

psychological, academic and physical development, such as lower school achievement, behavior disorders and underweight (Ramsey *et al.* 2011). Therefore, research focused on the determinants of food insecurity amongst primary school children and how it impacts child development, is long overdue and imperative to undertake.

The study from which this paper derives, sought to address the aforementioned grey area in the literature; hence the objective of the study, upon which this paper leans, is to determine and characterize the determinants of food insecurity amongst primary school children in Matobo district, through the lens of affected parents and school staff. Hence, this paper is based on a key objective of the study namely the determinants of food insecurity amongst primary school children in Matobo District, in south-western Zimbabwe. The remaining sections of this article are structured as follows: the research methodology is provided, followed by the results and discussion of the results and lastly a conclusion.

## Theoretical Framework

This article leans on the entitlement framework by Amartya Sen (1981) and the work on food insecurity by Chattopadhay (2000) who linked the Zimbabwean situation to Sen's framework. Sen (1981) stated that starvation occurs when a person does not have access to enough food, often despite the availability of food for those who can afford it (Gillespie & Kadiyala 2005; Hamid 1994). There are two types of entitlements, that is, endowments (or owned assets, such as land) and exchange entitlements, which are mediated by social relations (Kerr 2005:61). According to Hanazaki *et al.* (2013:156) there is direct entitlement (e.g. a family grows its own food or catches its own fish); indirect entitlement (e.g. a family uses income to purchase food) and transfer entitlement (e.g. a family obtains donated food). A family can have all the three entitlements and be food secure or it can lose all of them and be food insecure. Households experience food insecurity when entitlements are disrupted and a household fails to switch to another way of obtaining food (Hanazaki *et al.* 2013). When households lose their entitlements they become vulnerable to food insecurity even though food is available, that is, food insecurity could exist in the midst of plenty (Chattopadhay 2000). Food insecurity is a result of a lack of entitlements by households to access food; it is not necessarily a result

of food availability decline per se. According to Sen (1981) explanations that locate the cause of famine in reductions in food supply are less satisfactory than those which attribute famine to the inability of individuals or households to access food through a range of alternative means (Ansell *et al.* 2014:613).

## Context of the Study

The study was carried out in Matobo district, in Matabeleland South province of Zimbabwe. Matobo is situated in agro-ecological region IV. The average annual temperature is 19.9 °C and precipitation averages 457 mm. The area experiences a semi-arid climate as it is subject to periodic seasonal droughts and severe dry spells during the rainy season (Meteorological Services Department 2007). The rainy season occurs from November to March. Most of the areas in the district have wetlands, which sustain community gardens during the dry season. Vegetation is dominated by *Acacia fleckii*, commonly known as black thorn; mopane (*Colophospermummopane)* and *Cactusspp*, a dry land plant species (Ndhlovu 2009). There are 72 primary schools in Matobo district. The study areas were specifically limited to Wards 16 and 17 of Matobo district. Figure 1 shows the location of Matobo district in Zimbabwe, and Wards 16 and 17 are indicated in the following map. Convenience sampling was used to sample (select) six primary schools for easy accessibility.

## Research Methodology

A qualitative case study approach was used to determine and characterize the determinants of food insecurity amongst primary school children (Matobo district) through the lens of their parents and teachers given ethical concerns about researching the vulnerable, in this case, children (Liamputtong, 2007). Indeed, this is a limitation of the study but it was weighed against the prospective trauma of interviewing young learners about the food insecurity that they were experiencing. Qualitative research attempts to make sense of, or interpret, phenomena in terms of the meanings people have highlighted (Denzin & Lincoln 2005; Creswell 2014). Case studies are the preferred approach when 'how' and 'why' (research) questions are to be answered, when the researcher has little control over events, and when the focus is on a current phenomenon in a real-life context (Karin & Suzanne 2016:71). The case study was thus the chosen strategy as the researcher wanted to know: why are primary school children experiencing food insecurity in Matobo district in Zimbabwe?

**Figure 1: Location of Matobo District in Southwestern Zimbabwe (not drawn to scale). (Adapted from google images.)**

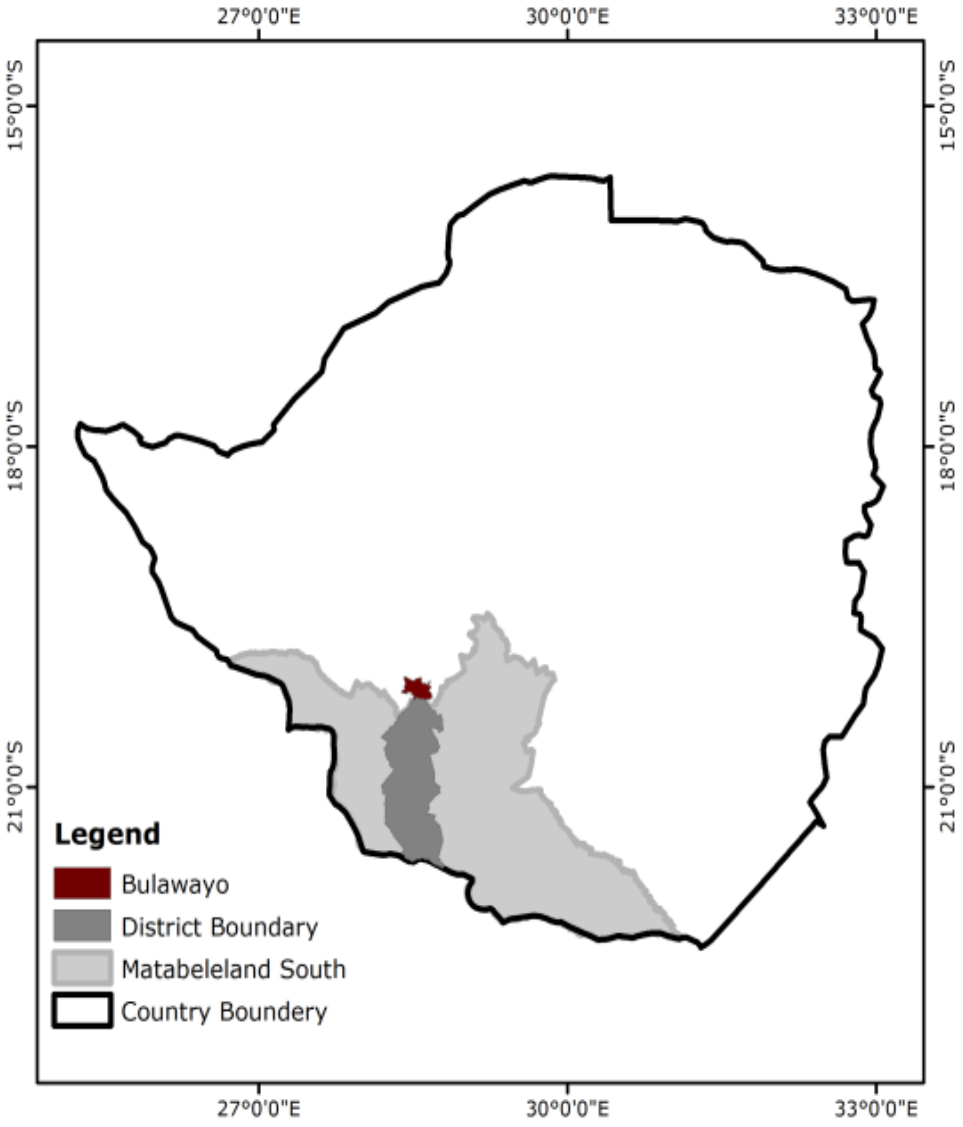
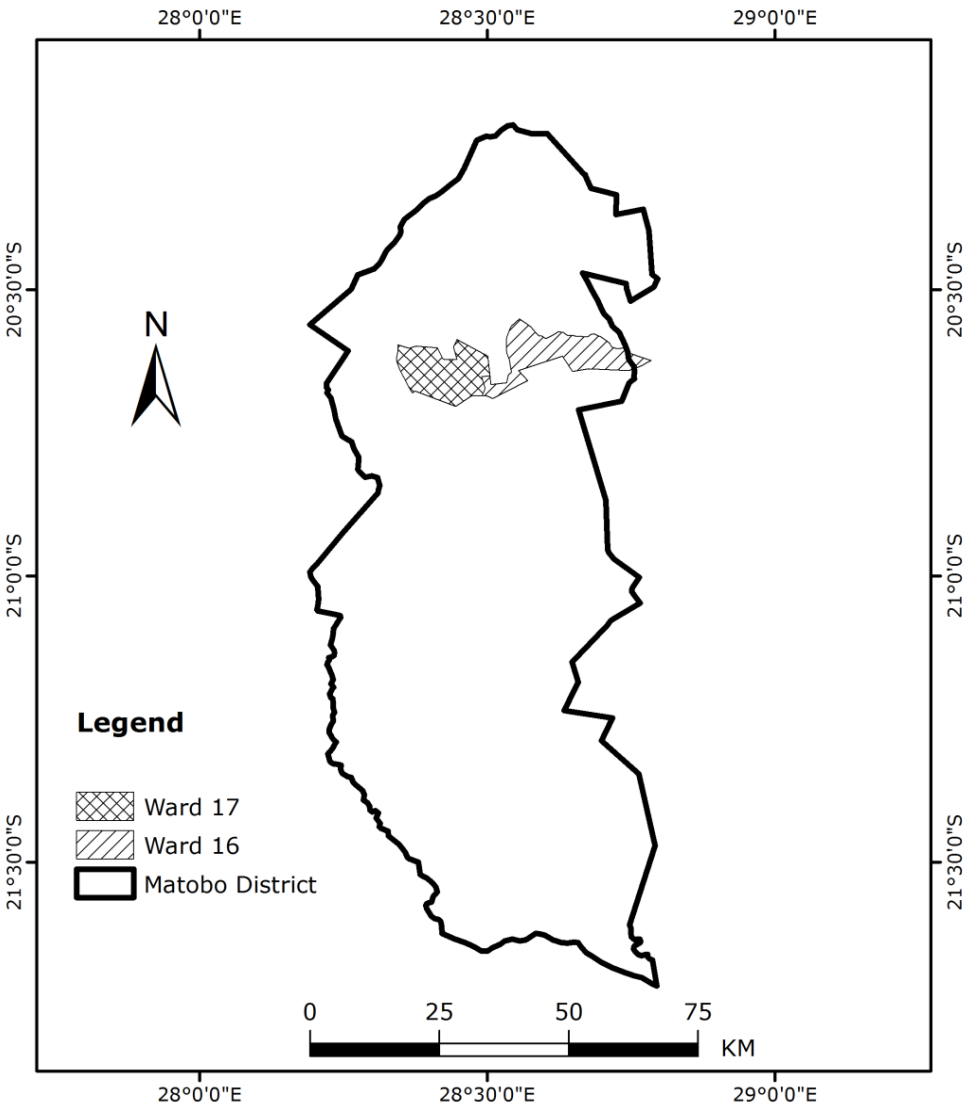


**Figure 2: Location of Ward 17 and Ward 16 in Matobo District (not drawn to scale). (Adapted from google images.)**



Data was collected from six primary schools through semi-structured interviews and focus group discussions. Semi-structured interviews were used to gather data from two administrators (Principals and H.O.Ds) per school (n=12) who understand the phenomenon of food insecurity in their school contexts and three teachers (of vulnerable children) per school (n=18 interviews with teachers) and there was one focus group discussion per school with parents of vulnerable children (n=6 in total).

Schools were sampled through convenience sampling for easy accessibility, that is, schools located along the main road in the district. In convenience sampling the samples are selected because they are accessible to the researcher (Magwa & Magwa 2015). Purposive sampling was also used to sample parents and teachers of vulnerable children, and school administrators. These were considered as information-rich sources on determinants of food insecurity in southwestern Zimbabwe. Purposive sampling is exercised to specifically pick information-rich cases linked to the phenomenon of food insecurity, that is, identifying and selecting individuals or groups of individuals that are especially knowledgeable about or experienced with a phenomenon of interest (Bloor & Wood, 1996 cited in Chattopadhyay 2000; Palinkas *et al.* 2015). School administrators are more experienced in the system, thus they tend to be knowledgeable about the barriers to education amongst children and they are the link between the school and various stakeholders such as the government and non-governmental organizations providing food aid.

In this study, the data was sub-divided into various meaningful units or themes in relation to the critical questions of the research. The themes that emerged as the determinants of food insecurity include social, economic and environmental issues.

Ethical principles were taken into great consideration. Among the most important ethical principles, the qualitative researcher has to adhere to are informed consent, voluntary participation, confidentiality, protection from harm and maintenance of the well-being of the participants (Karin & Suzanne 2016:62). The researcher obtained permission from the Provincial and District offices of the Ministry of Education, Sports, Arts and Culture as these are the gatekeepers. Participation in the study was voluntary and the participants were informed that they could withdraw from the study at any time if they chose to do so. The respondents were assured that the data collected would be used solely for research purposes. The researcher outlined the purpose of the study and the approximate time taken to complete each interview, which was

between 45 - 60 minutes duration. Anonymity was ensured by the use of pseudonyms for all participants and schools so as not to embarrass or harm participants. The researcher did not interview learners but rather their teachers and parents so as to protect them. Preliminary visits were done to make appointments with the participants and convenient times when children were not present were decided upon in advance for the interviews and focus group discussion with parents. Schools offered classrooms to be used for focus group discussions in the afternoons when children were involved in co-curricular activities such as sports. The researcher was assisted by school administrators to invite parents and the parents heeded the call. Staff members were interviewed in their offices for privacy.

The validity of the data was ensured through triangulation of methods; data was generated on the phenomenon using two tools (interviews and focus group discussion) and three separate sources of data (principals, H.O.Ds, parents) to provide a deep understanding of food insecurity being experienced by primary school learners in the Matobo district. The reliability of the study is evidenced in the rich detailed quotations from the participants, presented in this paper.

## Findings and Discussion

The researcher, using thematic content analysis, identified three major determinants of food insecurity amongst primary school learners through the lens of affected parents and teachers: these are social, economic and environmental determinants.

## Social Determinants

Within the theme of social determinants, the link between HIV/AIDS and single parenthood, child-headed households and old age is discussed.

### *Food Insecurity in Female-headed Households*

Most of the food insecure primary school children or learners have single parents and the major cause of this is HIV and AIDS (n=12). It is difficult for

single parents, especially women, and sometimes due to ill-health to fend for their children and provide all basic needs by themselves. They tend to rely on begging and also working in other people's homes for long hours as maids or weeding in the fields. The remuneration that they get is very low that it cannot sustain their families. For example, Mrs. Dube explained:

> *I spent almost five days drinking black tea with my children until my neighbours and the village-head gave me a 10kg bag of mealie-meal. I am a single mother who has two children and I struggle to provide for them. I usually don't know where my next meal will come from. When the situation intensifies I usually get assistance from my neighbours and they always come to my rescue, otherwise my kids would be dead by now.*

Ms. Gumede also highlighted that:

> *We need to be empowered with land as women, but our culture in this country is against the idea. Land is for men not women. If you are not married it becomes difficult to access land.*

The above reveals the challenges faced by single-parent mothers in ensuring food security in their households. The patriarchal system is one of the poverty drivers in the community. It leads to feminization of poverty as women are discriminated against in resources such as land. In rural areas agriculture is the main livelihood, therefore, depriving women access to the land and denying them opportunities to learn to farm the land, renders them susceptible to food insecurity. Women now have a double role, which is productive work (to earn a living) and also to be caregivers (of their children) and if they are barred from accessing and creating a livelihood from assets such as the land, then their children bear the brunt in the form of food insecurity.

The health status of the children is also an issue. Children (n=4) from food insecure households are also HIV positive and are further unable to access food in schools which has negative repercussions for their well-being and learning. Mr Ndlovu (principal) explained:

> *Some of these food insecure children are HIV positive and they come to school on empty stomachs. When they take in ARVs (anti-retroviral*

> *drugs for HIV treatment), they become very weak to hunger and they normally sleep in class or faint as they try to participate in extra curricula activities*.

## *Food Insecurity within Grandparent-headed Families*

HIV and AIDS has claimed many lives of the economically active people in Zimbabwe. Most of the learners (n=15) who are food insecure have lost one or both parents due to HIV and AIDS and they live with their grandparents. The grandparents are no longer economically active in various livelihood options and thus do not have access to a regular income and cannot adequately provide food for their children. HIV and AIDS has reduced human capital, which is one of the most important assets of sustainable livelihoods. This shortage of labour in most of the households leads to low productivity. For example, MaKhumalo stated:

> *I can go for two or three days without eating anything. As an old woman I stay with my grandchildren and their parents are deceased. I get US$15 per month from Social Welfare as a grant. World Vision also gives us 50kg of maize. This does not last us a month because we share with neighbours since everyone is food insecure.*

## *Food Insecurity in Child-headed Families*

Some of the vulnerable learners come from child-headed families with no sustainable source of income (n=7). The major source of income in such families is the trading of wild fruits. Households that rely on this livelihood compete with wild animals such as baboons and monkeys to get wild fruits and the market for these fruits is limited in rural areas. Wild animals also devour their fields during the day and at night. It is difficult for most household members to guard the fields both during the day and at night due to limited human resources. This mostly affects households with single parents, elderly parents and child-headed families. Sitsha (a parent) explained:

> *It is difficult to earn a living this side of the country. I grow crops for wild animals like baboons and monkeys. These animals also eat our poultry, fruit trees and even our seeds.*

### *A Dependency Syndrome Leading to Food Insecurity*

The results from the data revealed that food aid has resulted in a dependency syndrome. The interviews with teachers revealed that most of the parents of food insecure learners depend on food aid. The results show that some parents are not involved in income generating projects as they expected World Vision to donate food to the community. Such parents tend to waste a lot of time roaming around the village instead of participating in development projects to build sustainable livelihoods. Mr. Ngwenya a teacher explained:

> *The problem with people in this area is that they have turned into beggars and receivers of food from Food Aid Programmes. Most of them are lazy and they do not want to stand on their own and support themselves. More so, others have actually stopped their traditional way of surviving such as farming.*

Mrs. Sibanda commented:

> *The community is very much aware that they are food insecure but they do nothing to change this bad situation. What they do is to ask for interventions in terms of food provision from donors. It is now known that this area is for beggars.*

It is evident from above that the teachers are firm in their belief that families are unable to survive in Matobo by their own means and are food insecure, because they have become dependent on donor agencies providing food for their survival. Their views are just one perspective and the next section reveals that there are parents who are attempting to ensure that they achieve food security for their families.

## Economic Determinants

It is evident that there are also parents who are making efforts to be financially independent.

### *Unemployment as a Cause of Food Insecurity*

Nearly all of the learners who are food insecure have unemployed parents and

guardians. These households find it difficult to access food as they lack financial resources.

Mrs Gangeni explained:

> *Our children working in South Africa are struggling to make ends meet because of the weakening of the Rand against the US$. They are finding it hard to put food on the table and there is high unemployment in Zimbabwe. We will die of hunger.*

Mr Jubane also explained:

> *Last season I failed to buy seeds because my children didn't send money home. I heard them saying the Rand is now weak and I don't really know what that means. I'm trying to survive by selling wild fruits and it is no longer profitable as in the past due to climate change and population growth.*

Some of the parents are self-employed. They are involved in vending (selling fruits such as mangoes, guavas and wild fruits), wood carving, beekeeping, and thatch grass harvesting. They get less capital from these livelihoods due to a shortage of markets in the rural areas and climate change.

## *Loss of Livelihoods as a Cause of Food Insecurity*

Most of the parents of learners are slowly losing their livelihoods as a result of climate change. The water-table is gradually falling and rivers quickly dry-up during the winter season making it impossible for irrigation activities. Some of the irrigation schemes are distant from households and this is a great challenge for the elderly and ill parents. Water for irrigation is also very expensive, that is US$20 per month per household. Most of the fields are now lying idle as the majority of households cannot afford the cost of irrigation. Parents in a focus group discussion highlighted that the quantities of wild fruits have highly plummeted as a result of climate change. They are now competing with wild animals for the few remaining wild fruits and these animals also eat vegetables in gardens because they are not getting enough in the forest. Remittances are

also no longer a sustainable source of livelihood. Most of the parents (n=8) who have children and relatives in South Africa highlighted that they no longer get remittances as frequently as in the past due to the weakening of the rand against the United States dollar (mostly used in Zimbabwe) and high unemployment. Thatch grass harvesting is also no longer sustainable because of successive droughts, veld fires and population growth. During the Fast-track-land reform people were settled in areas that produce a lot of thatch grass and illegal gold panners are the major culprits in veld fires. Some households are gradually losing their livelihoods due to climate change and population growth and women were discriminated against during the land reform program. Also, some parents were reluctant to be resettled as they were emotionally attached to their home. Mr. Tshuma explained the loss of livelihood:

> *In the past we used to harvest thatch grass and mopane worms for sale so as to get cash and access food whenever there was low output in the fields. Nowadays we no longer have mopane worms and thatch grass and we are now competing for the few remaining natural resources. Climate change has greatly affected our livelihoods'*

Mrs. Ntini stated:

> *Households that manage to harvest from their fields and gardens tend to sell their produce on credit due to shortage of markets. Buyers take a lot of time to pay and do not even pay back. This is one of the challenges affecting these farmers.*

The above reveals that productive assets such as mopane worms and thatch grass are dwindling as a result of climate change. The increase in aridity leads to the disappearance of bio-resources. Some farmers are compelled by desperation to sell their harvests on credit, which has negative repercussions for families. They tend to lose-out as some clients fail to pay for the goods that they have taken on credit. Most of the participants in the study said climate change is the major cause of food insecurity in the area. Climate change has depleted pastures leading to a loss of livestock and there is a shortage of irrigation water. Successive droughts lead to low agricultural output thereby worsening food insecurity. A Headmaster (Principal of school) stated:

> *There is a serious shortage of food in this area which emanates from a number of issues, amongst which are prolonged and chronic shortage of resources. People in this area are chronically hungry and they starve since some go for days without eating anything.*

Mr. Bhanko explained in detail:

> *The situation has been worsened by the fact that the adaptation capacity has been weakened by both climate change and economic hardships in the country. Due to prolonged droughts, the area has lost one of the most valuable natural resources, that is, the mopane worms. People used to generate income from these worms so as to access food.*

## *A Shortage of Farming Inputs Resulting in Food Insecurity*

Most of the learners come from households where agricultural production is very low. A shortage of inputs was identified as one of the causes of low productivity. Unemployment and loss of livelihoods lead to shortage of financial capital thereby causing poverty, this ultimately hinders households from accessing agricultural inputs, and the result is chronic food insecurity. Most households lack a means of production because of poverty. For example. Mr. Simela stated:

> *I'm very poor, I don't have draught animals, I don't have farming inputs and my piece of land is very small. I usually assist those who have draught animals but they come to plough my fields very late towards the end of the planting time, so I don't benefit much. I normally practice organic farming but it is very labour intensive, it needs young people who have a lot of energy.*

The above quote reveals a number of factors that affect food insecurity from a farmer's perspective.

## *Small Land Holdings*

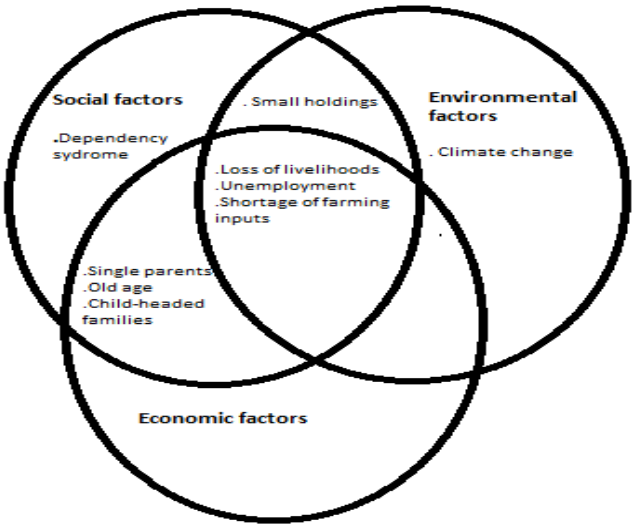
Matobo district is mountainous making it difficult for crop production. Most households have small pieces of land and they cannot sustainably practice crop

production. The mountains in the area are also a habitat for wild animals like baboons, monkeys, wild pigs and leopards, which are pests to crops and livestock. Households thus find it difficult to practice agriculture due to small pieces of land and animals destroying crops and killing their livestock.
Mr. Nyathi explained this:

> *Our area is full of rocks and this minimizes land for crop production, and the few crops that we grow are eaten by baboons. We cannot keep goats and poultry because they are eaten by baboons and leopards. These are some of the causes of hunger in our area.*

Matobo district is in a semi-arid environment. Most of the farmers grow drought tolerant crops such as millet and sorghum, however, the greatest challenge are quelea birds that feed on these small grains. Households try to guard their fields against animals and birds but this is a very demanding exercise for the elderly and ill parents. Some learners fail to go to school as they will be manning the fields and this compromises their learning.

**Figure 3: Determinants of food insecurity in Matobo District**



## Discussion

The results of the study show that there are three major causes of food insecurity, albeit they are interrelated as we show and annotate this in figure 2, above. Loss of livelihoods, unemployment and a shortage of farming inputs are social, environmental and economic determinants. Single parents, old age and child-headed families are social and economic determinants of food security. Lastly, a small holding is both a social and environmental determinant.

## Multiple Intersecting Determinants of Food Insecurity: A Dearth of the Five Livelihood Assets

The following section discusses how the various capitals interact leading to food insecurity in Matobo district: human, natural, financial, social and physical capitals.

### *Demographic and Health Determinants of Food Insecurity*

The results reveal that most of the learners who are food insecure have single parents or guardians who are economically inactive due to ill-health and/or old age. The majority of single parents (n=twelve) are women who have lost their partners due to HIV/AIDS. The study revealed that food insecurity is rife in women-headed households due to ill health and a lack of access to livelihood assets (such as land, seeds, fertilizers, credit facilities) due to gender-biased traditions. Studies have shown that in southern Africa, 58 percent of the HIV/AIDS affected people are women and this threatens food security, as most women are involved in agricultural production. Female-headed households often have lower adaptive capacity due to their limited access to economic resources and this is mostly a result of social discrimination (Agarwal cited by Cramer *et al.* 2016). These households are food insecure due to shortage of labour, loss of assets and skills, adult mortality and the increased burden of care (Ansell *et al.* 2009) which was also evident in the present study. Consistent with the findings of this study, are the results of the study that was carried out in Australia by Ramsey *et al.* (2011) which revealed that a higher proportion of single parent households are food insecure. Assets such as livestock are sold to purchase medicine or cover other illness-related costs and this increases

household vulnerability to food insecurity. The gathering of wild foods or engaging in casual and migrant labour becomes problematic due to a shortage of labour, farming skills are lost, livelihoods disintegrate and household earnings shrink thereby causing food insecurity (Ansell *et al.* 2009; Clover 2003).

HIV/AIDS has also increased the number of child-headed families that are very poor. Additionally, poverty is a result of loss of property (endowment) when parents die as was also evident in this present study. Children do not have the necessary knowledge, skills and time to farm the land if they are expected to attend school. Mbaya (2002 cited by Ansell *et al.* 2009) also alluded to the loss of land and livestock as well as farming equipment being sold to fund medical and funeral costs or items being misappropriated by relatives. A loss of entitlements clearly exposes children to food insecurity. Ansell *et al*. (2009) also found that those children who inherit land are too young or inexperienced to farm it, since children acquire livelihood skills by working with older kin. The unexpected death may interrupt intergenerational knowledge transfer and they report that many children withdraw from school to address labour shortages. Some of the orphans end up engaging in unsafe sexual behaviours and contracting HIV/AIDS due to food insecurity and the lack of guidance from adults. The relationship of HIV/AIDS to food insecurity was found to be bidirectional: vulnerability and food insecurity feed into the very risky behaviour that drives the HIV/AIDS pandemic, and the impact of HIV/AIDS exacerbates food insecurity, which again feeds into risk (Clover 2003:12). Child headed families fail to access food in the market, due to a limited access to gainful off-farm employment opportunities and income-generating activities (Moyo 2007). The underdevelopment of rural areas as is the case of Matobo is also limiting the opportunities for generating sufficient income for accessing food.

## *The Nexus of Poverty and Food Insecurity*

Poverty is the key determinant of food insecurity with a high potential of amplifying people's vulnerability (Bele, Sonwa & Tiani 2014). The present study indicates that the impacts of social and environmental determinants of food insecurity are exacerbated by poverty. Food insecure children come from poor households. Unemployment, a loss of livelihoods and a shortage of

markets lead to low income, poverty and ultimately failure to access food. The findings of Manyena, Fordham and Collins (2008) concur with the findings of this study in that food insecurity is a result of a lack of assets (especially entitlements such as the ability to grow your own crops for your own needs) which could be converted to money to enable families to access food. Insufficient financial capital hinders families from accessing sufficient foods that are consistent with dietary recommendations for health and well-being (Ramsey *et al.* 2011). It was observed that although some participants had endowments, such as land, they were still food insecure due to several factors. These included but were not limited to climate change impacts such as the costs of irrigation for the semi-arid Matobo district, inadequate farming knowledge, an inability to farm the land due to biographical reasons such as youth/old age. Interestingly, in Sudan, people chose to go hungry in order to preserve their assets and their future livelihood; they chose not to consume food rather than sell their vital assets (de Waal, 1990 cited by Molnar 1999). This means that some households can own other entitlements (livestock) and be food insecure, which is contrary to Amartya Sen's observation.

## *The Feminization of Food Insecurity*

At the household level, women play a major role in the provision of food security for their families. However, most of the food insecure families are very poor and women head them. It has long been reported that families headed by women are food insecure due to poverty, discrimination, divorce and longer life expectancy (Molnar 1999). In the present study, a lack of entitlements by women is necessitated by cultural values and attitudes which are patriarchal and which treat women as minors. According to Mutopo (2011:1029), most women in Zimbabwe do farm their husbands' land but they do not have any form of title to that land, land ownership is patrilocal. Land is viewed as a resource associated with men. During the Fast-Track Land Reform Programme (FTLRP), most women were discriminated along political, social and economic lines (Mutopo 2011). Molnar (1999:492) asserts that cultural factors that repress the role and status of women diminish food security not only for women but also for their children. It has been observed that women are the main farmers but their subordinate cultural and social position often curtails their abilities to farm as productively as possible (Goebel 2005:150).

Poverty leads to food insecurity thereby reducing the capacity for work and resistance to diseases, and it affects children's mental development and educational achievements (Clover 2003). Studies have shown that when a disaster strikes, the poor and socially disadvantaged are greatly affected and are the least equipped to cope with the impact due to lack of information and resources. However, if women have access to and control over land, family livelihood patterns can improve because most of the women-headed households have better management policies in terms of farming practices, the marketing of the produce and in use of the income (Mutopo 2011:1031). In other words, a matrilineal and matrilocal system in society leads to food security as women would be owners of the land and involved in income decisions (Kerr 2005) but in Zimbabwe, the women would need to be educated about successful farming practices if they have not partaken in significant ways to farming as a livelihood option.

## *Sustainability of Coping Strategies in Ensuring Food Security*

Families that have livestock tend to sell them off including assets to finance food purchases. However, due to the shortage of markets and available access to markets, they sell them at reduced prices or on credit whilst food prices would be rising. Harvests from the fields and forests and carvings are also sold on credit due to the desperate condition in which the people find themselves. Families tend to get low incomes from these 'trade-offs' and this further exacerbates the vulnerability of the community to food insecurity (Misselhorn 2005). In Zimbabwe, most households are failing to purchase farming inputs because of poverty. It is estimated that in 2002, about 90% of the 300 000 Zimbabweans who were allocated land during the FTLRP lacked farm inputs and 94% did not have seeds for the upcoming seasons and this reduced output by 75% from the previous year (Clover 2003). Land reform programmes have enormous potential to increase agricultural production if they are accompanied by comprehensive programmes of agrarian reform including access to credit, savings and markets in rural areas (Clover 2003:10). These findings are consistent with the observation of Amartya Sen (1981) that people starve when they do not have the means to buy food. Ofcourse, if women were made to be the beneficiaries of the land reform in Zimbabwe, this will also have advantaged them and their families.

Some families in the present study have embarked on various income generating projects such as bee keeping and poultry farming. This is in line with the assertion of Clover (2003) that food insecurity can be prevented by creating public projects to provide income for potential famine victims. However, in the study area just a few households carried out these income-generating projects and they were not yet a sustainable livelihood. Parents during a focus group discussion indicated that these projects are a challenge to many households, as they have to follow standard measurements when constructing fowl runs making them impossible to fit in their small yards and the market prices for products were not attractive. In addition to this, for many of the poorest households, projects which generate revenue that are not farm dependent were not viable; indeed Burke & Lobell (2010) have noted that off farm projects are limited by liquidity or human capital constraints i.e. shortage of cash and skills.

## *Faulty Government Policies as Determinants of Food Insecurity*

The lack of purchasing power at household level in Zimbabwe is also a result of failure in the political accountability of government and even political interference (Clover 2003). Expropriation of farms and industries in the last decade shunned away investors and a lot of people were retrenched. Scholes and Biggs (2004) cited by Gregory, Ingram and Brklacich (2005) observed that food insecurity in southern Africa in 2002 - 2003 was not a result of climatic factors only but it was a result of regional and global political and economic factors including legacies of structural adjustment, government policies, conflict and war. This implies that some policies work well in other regions and are irrelevant in sub-Saharan Africa. The political environment greatly contributes to food insecurity as witnessed in Zimbabwe but Amartya Sen (1981) did not consider it as a determinant of food insecurity. Sen's (1981) explanations on food insecurity were too apolitical and ahistorical (Ansell *et al*. 2009). Food insecurity is attributed to the nation states' faulty policies or poor implementation of sound policy (Molnar 1999).

Population growth is associated with human ingenuity (Boserup 1965) and human adaptability is the greatest resource available (Scanlan 2001). However, faulty government policies are a barrier to human ingenuity. According to Scanlan (2001:255) the development of rural areas offsets

problems of population growth and food insecurity due to better food distribution via transportation networks thus increasing availability of food and reducing access problems. Without rural development, human ingenuity might be very expensive for the poor rural people as experienced in the study area where most of the households cannot afford the expenses associated with irrigation. When human systems fail, repair costs for irrigation systems are much greater, and the ability of a reliable source of water to realise its promise for food is greatly impaired (Molnar 1999:494).

## *The Role of Climate Change in Food Insecurity*

The study revealed that climate change and variability have intensified poverty as most people have lost their livelihoods and natural resources. The quality of thatch grass is deteriorating and non-timber forest products such as *mopane* worms are getting scarce, all this is attributed to successive droughts in the district. Most families rely on rain-fed agriculture and harvests are close to none, during times of weather anomalies, for example during droughts. Irrigation water is beyond the reach of many households as surface and ground water sources are shrinking. Climate change has greater effects on those living in poverty as they depend most heavily on climate-sensitive livelihood activities such as agriculture and exploitation of natural resources (Bele, Sonwa & Tiani 2014). Weather anomalies tend to have devastating effects on most households as they do not have alternative water sources but have to rely on rainfall. Entitlement to water is important for ensuring production throughout the year, however, in a changing climate; diversification of incomes out of agriculture is a plausible adaptation strategy in sub-Saharan Africa (Burke & Lobell 2010:142).

Sunderland (2011: 266) postulates that around one billion people rely on wild harvested products for nutrition and income and the 'invisible' trade in wild resources is estimated to generate $90 billion/annum. Climate change has greatly compromised this viable livelihood in Matobo district. Frequent droughts have reduced the quantity and quality of biodiversity. Local people in Matobo district compete with outsiders (from other districts) in the harvesting of wild products such as fruits, mopane worms and thatch grass. Due to a shortage of food in the forests, wild animals such as baboons and leopards end up invading homesteads and eating chickens and goats. House-

holds lose important assets as small ruminants provide insurance and a substantial source of income and it helps spread income risk (Douxchamps *et al.* 2015). According to Songok *et al.* (2011:76) community food reserves and traditional food storage systems, at household level, should be established in order to empower communities regarding the need to ensure food security at the local level and reduce losses due to poor storage.

Population growth in the district has led to the fragmentation of the land resulting in households having small pieces of land for agricultural activities, which are over cultivated. Over cultivation of land leads to loss of soil fertility which is an essential entitlement for high productivity. Over cultivation leads to soil degradation, which is irreparable environmental damage, as highlighted by the Neo-Malthusian perspectives that population growth will outstrip the earth's ability to provide for its inhabitants (Scanlan 2001:245). Malthus (1798) and Sen (1981) echoed the same sentiments that over population can lead to loss of entitlements and eventually experiences of food insecurity. The largest proportion of the hungry is concentrated amongst the world's landless, or smallholder farmers whose plots are too small for their needs (Matshe 2009). The writer, therefore, theorizes that population growth without sustainable government policies can strain resources (entitlements) and this eventually results in food insecurity. Households in the study area are vulnerable to food insecurity as they lack natural capital, which is a buffer against hunger and famine. Land is an asset and it forms the basis of a household's entitlements (Jesse & Fellow 1995). Rural households with a sizeable amount of land are better off, in terms of personal welfare, and less-likely to be poor and food insecure than those with marginal lands or without land (Mlambo 2000 cited by Matshe 2009). The farmers in Matobo have small farmlands that are inadequate for farming. Land is not only used for crop growing but to create other livelihoods like poultry production, wood fuel and edible fruits. Land is the key to survival and feeding one's family (Bele, Sonwa & Tiani 2014). It is evident that in particular for the children to be food secure in Matobo district, that sufficient fertile land for their families to cultivate and farm is essential.

## Conclusion

The determinants of food insecurity are multi-dimensional in the rural areas of Matobo district; however poverty and climate change seem to be the major

contributors. Poverty restricts people from diversifying their livelihoods as they will be lacking the five livelihood assets: - that is, human, natural, financial, social and physical capitals. Most of the households become vulnerable to environmental factors as a result of poverty. Climate change and variability also exacerbate food insecurity because most of the rural livelihoods hinge on the availability and affordability of water and fertile adequate land to ensure food security. A shortage of water and fertile land renders almost all rural livelihoods unsustainable thereby intensifying food insecurity. The government can ensure food security in Matobo district, by reviving the existing irrigation schemes and supporting income generating projects at household level through training and providing startup capital rather than a dependency on donor agencies providing food. In a changing climate, to buffer food insecurity in the face of a short-run climate shock, families should diversify their livelihoods by engaging on off-farm activities that are less climate-sensitive but they would need interested stakeholders like non-governmental organizations to empower them on the types and scales of the different options.

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*Determinants of Food Insecurity amongst Primary School Children*

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# Integration of Climate Change into the Namibian School Geography Curriculum

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## Abstract

Of the various subjects taught in Namibian schools, Geography is often perceived as one that can make a significant contribution to climate change education. Despite this, there is a dearth of research on climate change integration into the Namibian school Geography curriculum. This paper, therefore, aims to explore the integration of climate change content into the Namibian school Geography curriculum. The paper analyses the Namibian school Geography curriculum and draws on four semi-structured interviews with Geography teachers. Shulman's concept of Pedagogical Content Knowledge was used to analyse the data. The analysis shows that climate change content is not yet fully integrated into the Namibian school Geography curriculum. Elements of climate change are integrated in the Geography curriculum; however the teachers experience conceptual challenges in integrating this content in their teaching. This is due to their lack of pedagogical content knowledge, lack of professional development support and inadequate quality teaching resources on climate change. The paper recommends more coverage of climate change concepts into the Geography curriculum and professional development for teachers on climate change education. This has the potential to provide secondary school learners with the knowledge on climate change which can help mitigate the impacts of climate change in Namibia.

**Keywords**: Climate change, Geography curriculum, Education for Sustainable Development (ESD)


Print ISSN 1023-1757; Electronic ISSN: 2519-5476; DOI https://doi.org/10.29086/2519-5476/2018/sp21a11

## Introduction

In recent decades there has been evidence that changes in climate have caused impacts on natural and human systems on all continents. Climate change is a result of human activities such as agriculture, mining and processing industries (UNESCO 2015; UNEP 2016). 'Climate change is also caused by natural phenomena, which includes solar output, variations in the earth's orbit, volcanisms, ocean vacations, etc.' (Ozor 2006: 21). Some of the climate change impacts have been linked to human influences, including a decrease in cold temperature extremes, increase in warm temperature extremes and an increase in high sea levels (Ozor 2006; UNESCO 2015). Impacts from recent climate-related extremes, such as heat waves, droughts, floods and cyclones reveal significant vulnerability and exposure of some ecosystems and many human systems to current climate variability. The Fifth Intergovernmental Panel on Climate Change (IPCC) assessment report (2014) has revealed that further emissions of greenhouse gases will cause further warming and long-term effects in all components of the climate system, increasing the likelihood of severe, pervasive and irreversible impacts for people and ecosystems. This effect will be more prevalent in Southern Africa (UNEP 2016). Namibia is one of the countries in southern Africa whose vulnerability to climate change includes an increase in sea-level, droughts, floods, and possibly down-welling in the Atlantic Ocean (Namibia Ministry of Environment and Tourism 2011).

The IPCC (2014) assessment report warned the global community that urgent action is required to halt the worst effects of global climate change. There is a need to view both adaptation and mitigation within a wider framework of climate-resilient development pathways to realise the goals of sustainable development (IPCC 2014). This requires climate change education in all sectors of education (UNESCO 2015). Climate change mitigation requires education geared towards learning how to change lifestyles, economies and social structures that are based on excessive greenhouse gases production (IPCC 2014). Education can show people that, as conscious consumers and responsible citizens, they have a critical role to play in changing their lifestyles to address the current sustainability issues that humanity is facing (UNESCO 2015). In addition to education's integral role in individual behaviour change for mitigation, learning centres and schools have a role to play in mitigation in terms of becoming carbon neutral and energy efficient and reducing their own ecological footprint (Anderson 2012).

Nhamo and Shava (2014) note that learning; associated education processes and curricula need to be a central part of establishing climate-resilient pathways in southern Africa. There is some urgency to this, as Africa has been identified as a region highly vulnerable to the effects of climate change (IPCC 2014). ESD has been highlighted as important to reducing climate change actions (Urquhart *et al.* 2014; UNESCO 2015; UNEP 2016). This is key to the attainment of Sustainable Development Goal 13 that calls for taking urgent action to combat climate change and its impacts. Southern Africa has a long and rich history of environmental and sustainability education. Such education aims at offering learners the relevant knowledge, values, skills, strength, creativity and action competencies for the future (Lotz-Sisitka *et al.* 2017). This has been integrated in the countries' education agenda. In the Namibian context, the National Institute for Educational Development (NIED), which is the curriculum development institution in Namibia, has also made great strides to infuse environmental themes such as climate change in basic education systems.

Research has been conducted in southern Africa on the integration and implementation of ESD in the school curricula. The research by Lotz-Sisitka *et al.* (2017) focused on pedagogical approaches for ESD content in the school curricula. The subject of climate change is relatively new in the southern African school system, and consequently, learners and the general community have a limited understanding of the phenomenon (Urquhart *et al.* 2014; Anyanwu *et al.* 2015; Dlamini 2016). Nhamo and Shava conducted an audit in 2014 on how climate change education was being addressed in southern African countries across the different education levels as well as in the informal sector. This project complements other studies conducted in southern Africa and the UNESCO national case studies on climate change education (Urquhart *et al.* 2014; Anyanwu *et al.* 2015; Dlamini 2016). From the different research studies done, it is clear that climate change education is not yet fully integrated into the school curriculum in the southern African region. There is a constant demand for further research on the integration of climate change education and curriculum innovation at all education levels (Nhamo & Shava 2014; Anyanwu *et al.* 2015; Dlamini 2016) – a topic which this paper addresses from the context of the Namibian school Geography curriculum. Geography is one of the subjects offered in the Namibian school Geography curriculum and is described as 'both a powerful medium for promoting the education of individuals as well as a major contributor to international, environmental and

development' (Ekpoh 2009: 98). Dube (2017) argued that ESD (including climate change) can be implemented effectively through the Geography curriculum because the subject is interdisciplinary and deals with human - environment interactions. Integration of climate change education into the school curriculum is within the on-going trajectory of the Global Action Plan for Education for Sustainable Development, which is set to take the work of the United Nations Decade of ESD forward at national and global levels. The paper thus focused on how climate change content is integrated into the Namibian school Geography curriculum, and what challenges the integration of climate change content in the Namibian school Geography curriculum pose.

## Climate Change Education in the Global Context

Addressing climate change is now one of the major issues on the international political agenda, and it must be one of the issues that require emphasis in education (UNESCO 2013; UNEP 2016). To mitigate the impacts of climate change, countries all over the world have acknowledged that ESD, which includes teaching and learning about climate change, is key (UNESCO 2015). ESD is an approach to teaching and learning based on the ideals and principles that underlie sustainability and is applicable to all types, levels and settings of education (Lotz-Sisitka *et al.* 2017). As such, ESD engages with key issues such as human rights, poverty reduction, sustainable livelihoods and gender equality; and it encourages changes in behaviour that will create a more sustainable future (UNESCO 2015). Climate change education is, therefore, a subject that is well within the ESD agenda (Anderson 2012; UNEP 2016). Climate change education has, however, been differently defined in different contexts. The definition of the concept has been focusing mainly on climate literacy. However,

> *… Climate change education for sustainable development must be comprehensive and multidisciplinary; it must not only include relevant content knowledge on climate change, environmental and social issues, disaster risk reduction and sustainable consumption and lifestyles, but it should also focus on the institutional environment in which that content is learned to ensure that schools and education systems themselves are climate-proofed and resilient as well as sustainable and green* (Anderson 2012: 193 - 194).

To support the quote above, UNESCO (2013) notes that education is a powerful tool for developing people's knowledge and skills on how to address climate change. Climate change education helps learners understand the impacts of climate change and empowers them on how to adopt appropriate actions to more sustainable lifestyles (UNESCO 2015; UNEP 2016). Countries globally have, therefore, put in place policies that promote climate change education. Countries in the world have also signed up to different climate change conventions and have recently put in place interventions to combat climate change and its impacts through mainstreaming it in the education systems (Boyes *et al.* 2009; Anderson 2012). However, despite the efforts made to integrate climate change into the education systems of various countries, its implementation has not been successful as planned (Lorenzonia, Nicholson-Coleb & Whitmarsh 2007; Bangay & Blum 2010; Anyanwu *et al.* 2015; Dlamini 2016). Lorenzonia *et al.* (2007) conducted research on barriers perceived to be engaging with climate change among the United Kingdom public and the policy implications. They found that there was still a need for education that will result in a radical change in values, behaviour and institutions towards a paradigm of lower consumption involving genuine political and widespread social commitment, including at the individual level. However, Bangay and Blum (2010) noted in their research that there is still a need to pay attention to educational approaches that empower people of all ages to deal with the uncertain environmental concerns such as climate change.

Generally a great deal of effort has been devoted to mainstream ESD in the education systems in southern Africa. There has also been much research done on ESD mainstreaming in the southern African context. Some of the research has focused on ESD integration in the school curricula – across different subjects (Tshiningayamwe 2011; Lotz-Sisitka *et al.* 2017). Some of the research focused particularly on the uptake of ESD in the Geography curriculum (Simasiku 2012; Anyanwu *et al.* 2015; Dlamini 2016; Zokka 2016; Dube 2017). All these research studies found that there are major challenges in the implementation of ESD content in the school context. These relate to contextual issues and structural constraints within schools (Lotz-Sisitka *et al.* 2017). Writing in the Zambian context, Shumba and Kampamba (2013) and Namafe and Muchanga (2017) found that a lack of resources, a lack of teachers' knowledge and appropriate approaches as some of the challenges to ESD implementation in the modern schooling system.

## Climate Change Education in the Namibia Context

Namibia's vulnerable climate change includes an increase in sea-level, droughts, floods, and possibly downwelling in the Atlantic Ocean (Namibia Ministry of Environment and Tourism 2011). This has been integrated in the country's education agenda. Integration of environmental sustainability and climate change issues in Namibia is guided by Article 95 (I) of the Constitution, which calls for active promotion and maintenance of the welfare of its people by adopting policies that are aimed at the maintenance of ecosystems, essential ecological processes and biological diversity of Namibia and sustainable utilisation of living natural resources (Office of the President 2004). Out of Article 95, the Green Plan and Vision 2030 were developed. These plans aim to create a national common vision for sustainable development (Namibia Ministry of Education 2009). Namibia's Vision 2030 describes the kind of society that Namibia should become by the year 2030. The Vision 2030 document asserts that one of the threats to reaching the 2030 target is the adverse impacts of global atmospheric change (Namibia Ministry of Education 2009). In Vision 2030, the adverse impact of global atmospheric change, climate change and its linkages to water management, food and human health is noted. Namibia's Vision 2030 has challenged and put forward an agenda for education that aims to move Namibia from a heavy industry-based economy to a knowledge-based economy (Namibia Ministry of Education 2009). Climate change education can provide an important platform in Namibia's quest to shift from a heavy industry-based economy to a knowledge-based economy. It also provides awareness and training indispensable to regulating ecological, social or economic systems in response to climate change impacts (Namibia Ministry of Environment and Tourism 2011). Awareness provides the will to act on climate change, while training provides skills, which are the means of achieving a cutback in the alteration of global temperatures and ecosystems (Urquhart *et al.* 2014).

Furthermore, the Namibian Government ratified the international conventions that have a bearing on climate change education. Those include the United Nations Framework Convention on Climate Change (UNFCC), which aims to stabilise greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system (Fröhlich 2006). As a result of the above, the Namibian Government has put in place a Climate Change Policy, taking into account the constitution,

international conventions, regional policies and protocols. The aim of the climate change policy for Namibia is to ensure that Namibia strives for excellence in addressing climate change, by responding in a timely, effective and appropriate manner, via exploring adaptation and mitigation approaches relevant to different sectors at local, regional and national level, in order to improve the quality of life of its citizens (Namibia Ministry of Environment and Tourism 2011). The climate change policy for Namibia has identified mainstreaming of climate change into national development plans and the education environment as a key principle (Namibia Ministry of Environment and Tourism 2011). This principle is important in all formal and non-formal sectors of education. This is with recognition that education is important to mitigating the impacts of climate change in the country (Urquhart *et al.* 2014). The cross-cutting issues for adaptation and mitigating climate change have been integrated in the country's various educational strategies and plans. The different strategies and plans on climate change also highlight the need to building institutional capacity and research.

As a result of the above, the National Institute for Educational Development (NIED), which is the curriculum development institution in Namibia, has made great strides to infuse environmental themes in basic education systems. The Namibian basic education system is structured in four phases. These are: Early Childhood and Pre-primary education (Grade 0) and Lower Primary education (Grades 1 - 4); Upper Primary education (Grades 4 - 7); Junior Secondary education (Grades 8 - 10), and Senior Secondary education (Grades 11 - 12) (Namibia Ministry of Education 2009). The focus of this paper is Geography, a subject offered in the Junior and Senior Secondary phase (Grade 8 - 12). Because of its complexity (Oversby 2015), the integration of environmental learning is a cross-curricular theme across all phases of the Namibian school systems, across the different subject discipline (Namibia Ministry of Education 2009). Enviroteach was one of the projects that spearheaded mainstreaming of environment and sustainability issues in the Namibian basic education system (Enviroteach 1995). The project received substantial financial support from the Swedish International Development and Co-operation Agency (SIDA) within the agreement of the then Namibia's Ministry of Education, Arts and Culture and the Ministry of Higher Education, Vocational Training, Science and Technology. This support was used to train teachers on how to integrate environment and sustainability issues in teaching and learning, and to develop manuals for teachers on environment and sustain-

ability (Enviroteach 1995). Another project that supported the integration of environment and sustainability issues in the basic education system was Support Environmental Education in Namibia (SEEN), also supported by SIDA. SEEN assisted the Ministry of Basic Education, Arts and Culture, with the integration of environment and sustainability processes through curriculum development, professional development, and development of teaching and learning materials (SEEN 2005). In terms of Namibian higher education curriculum, there are no specific or stand-alone courses on climate change. Climate change topics are integrated in various environment-related modules such as Agriculture and Environmental Sciences, Sciences, Law, Geography and Environmental Studies, Environmental Management and Conservation Biology (Nhamo & Shava 2014; Urquhart *et al.* 2014). These arguably have an impact on teachers' pedagogical content for ESD.

## Pedagogical Content Knowledge (PCK)

Shulman (1986) was the first researcher to describe a knowledge base for teachers or to answer the question: what is it that teachers need to know? Shulman (2004) articulated a framework for teacher knowledge base that comprises four domains, namely: content knowledge, general pedagogical knowledge, context knowledge and pedagogical content knowledge. Content knowledge is the knowledge of the subject content (i.e. climate change content) that needs to be taught (Shulman 2004). He argued that it is important for teachers to obtain deep understanding of the fundamental concepts in their disciplines, and not merely having a huge collection of facts of the subject. It is this understanding of fundamental concepts and how these concepts are related and organised that enables teachers to use their subject matter knowledge for teaching (Shulman 2004). General pedagogical knowledge includes knowledge of classroom organisation and management, different teaching strategies or methods, assessment strategies as well as understanding classroom communication and discourses (Shulman 2004). Context knowledge is knowing about the background of the learners, knowing the organisational culture of the school, the governance and financing of the school district, to the character of communities and cultures (Shulman 2004). PCK is understood as the way in which the teacher recontextualises the content knowledge so that it can be understood by the learner (Shulman 2004). Shalem

and Pendlebury (2010) note that PCK is an overlap between subject knowledge and pedagogic knowledge.

Thomas (2013) noted that other components of teacher knowledge discussed by Shulman (1986; 2004) that are essential for excellent teaching were subject matter knowledge, curricular knowledge, knowledge of learners and their characteristics, and knowledge of education ends, purposes, and values. Thus from Shulman's initial work and the work of those who have followed him, it is evident that teachers draw on deep disciplinary knowledge, general and personal pedagogical knowledge and PCK. However, Shulman's knowledge domains are largely propositional and he has been critiqued for not taking into account the inter-relationship between theory and practice (Van Driel, Verhoop & De Vos 1998). He does not engage sufficiently with teachers' practical or professional knowledge, but seems to present a model where different kinds of propositional teacher knowledge simply 'add up to' a good teacher. However, a key concern in the area of climate change education is the relationship between propositional knowledge and practical knowledge (Nhamo & Shava 2014). Teachers also need conceptual knowledge for teaching which is much more than just subject knowledge (Shulman 2004) as this must be supplemented with innovative delivery mechanisms that can enhance learners' understanding of concepts being taught. Thus, for effective integration of climate change education in the Namibian school Geography curriculum, teachers need a variety of knowledge as presented by Shulman and academics that improved on his work.

## Research Design

The research was an explorative qualitative case study. Qualitative research stresses the socially constructed nature of empirical experiences, the intimate relationship between the researcher and what is studied, and the situational constraints that shape inquiry (Denzin & Lincoln 2011). Case study methodology is significant for learning about environmental learning (Lotz-Sisitka & Raven 2004) as it allows for researchers such as this author to research environment and sustainability issues in a context such as climate change, and it allows for improving professional practice. The data presented in this paper were collected through semi-structured interviews with four Namibian Secondary school Geography teachers (named T1, T2, T3 and T4). The semi-

structured interviews were chosen as they allowed the research to probe teachers' perceptions of climate change integration in the Geography curriculum (Denzin & Lincoln 2011). The Namibian school Geography curriculum documents were analysed on climate change content which served as primary data sources (Harland 2014). The data generated were analysed using Shulman's PCK model (Shulman 1986; 2004). Careful attention was given to ethical issues that confronted the researcher. This includes policies regarding informed consent, confidentiality and anonymity (Harland 2014).

## Climate Change Integration into the Namibian School Geography Curriculum

According to the Namibian Ministry of Education (2008), the Geography syllabus like other syllabi should address cross-curricular issues through geographic perspectives. The cross-curricular issues which have been introduced into the formal curriculum as themes to be dealt with in each subject are: Environmental learning, HIV/AIDS, Education for Human Rights, Population Education, and Information Communication Technology (Namibia Ministry of Education 2009). The aim of the Namibian school Geography curriculum is to enable learners to understand the nature of the following risks and challenges, and to know how they will impact on our society and on the quality of life of our people now and in the future. Those include:

- The challenges and risks we face if we do not care for and manage our natural resources
- The challenges and risks to health caused by pollution, poor sanitation and waste
- The challenges and risks to democracy and social stability caused by inequity and governance that ignores rights and responsibilities
- The challenges and risks we face from globalisation (Namibia Ministry of Education 2008:4).

The above clearly shows that the Namibia Geography curriculum makes provision for teaching environment and sustainability (i.e. climate change) challenges and associated risks. This was reflected in the curriculum analysis done (Namibian Ministry of Education and Culture 2005; Ministry of Edu-

cation 2008). Topics of the curriculum that are related to climate change include: weather and climate; population studies; urbanisation; production and management; coastal processes and erosion; impact of industries on the environment, e.g. energy/fossil fuels; impact of agricultural system on the environment, e.g. deforestation; impact of tourism on the environment, and population and settlement studies. It was evident from the curriculum analysis that climate change was not a separate topic but was integral to other topics in the Geography curriculum (Namibia Ministry of Education and Culture 2005; Namibia Ministry of Education 2008). This analysis was supported by Geography teachers who stated that efforts have been made to include environment and sustainability aspects in the Geography curriculum. Teachers noted that climate change aspects are integral to other topics in the curriculum. T4 and T3 stated:

> T4: *Climate change aspects in Geography are covered across the different grades under different topics. For example, in Grade 9 it is covered under the topic of climatology – pollution which releases greenhouse gases in the atmosphere causing global warming, greenhouse gases cause damage to the ozone layer, and in Grade 10 it is covered under the topic of ecology where learners are taught about the dangers of human activities such as desertification, deforestation and how they may contribute to climate change. In Grade 11 and 12, it is covered under the topic of environmental risks and management i.e. global warming, acid rain and deforestation.*
>
> *T3: Within the school curriculum, climate change is not dealt with as a separate topic, but rather integrated into other topics. Example in Namibia Senior Secondary Certificate (NSSC) Geography Syllabus, Natural Vegetation is a topic exploring the world's biomes and how change has occurred over time due to climate change.*

The above statements are an indication that Geography teachers had curricular knowledge. Curricular knowledge includes knowledge of the sequence of topics or concepts to be taught and the materials and resources suitable for a particular topic (Shulman 2004). Teachers note, however, that the amount of climate change content covered in the Namibian school Geography curriculum is inadequate. The Namibian school curriculum was in the process of undergoing a curriculum review. The teachers interviewed observed that even with the curriculum review, the amount of climate change content in the

Geography curriculum is still the same. They observed that climate change content is lost in the overarching themes. In relation to the amount of climate change aspects in the new Geography curriculum, T2 and T3 revealed:

> *T2: Climate change is hardly covered in the school curriculum, even with the new curriculum that has been so far implemented in Grade 7 and 8. The Grade 8 syllabus covers topics such as weather and climate, geomorphology and economic geography. But with the current Grade 11 - 12 curriculum, little is covered in terms of climate change.*

> *T3: The new curriculum does not cover much on climate change, and this is one of the challenges of teaching climate change as teachers are not allowed to teach anything beyond the syllabus. I thus do not teach much of climate change because of the limited syllabus coverage.*

The above analysis is worrisome. This resonates with earlier studies done on integration of ESD in the Namibian Geography curriculum (Simasiku 2012; Zokka 2016). Teachers interviewed were aware of the impacts of climate change. They expressed the opinion that the impacts of climate change are visible in their communities, thus noting that the importance of climate change within the Geography curriculum is not questionable. As T1 and T4 said,

> *T1: The importance of climate change is not questionable as climate change has the power to affect the livelihoods of our communities, thus should be incorporated in the school curriculum.*

> *T4: The importance of climate change especially in the context of Geography education it makes people become aware of its causes, makes people responsible about their daily activities and how these activities contributes to climate change, it allows people to study the trends of climate change and the future prediction, allows people to anticipate any consequences of climate change to their environment and suggest solutions, as well as educate people to minimise pollution.*

The above findings resonate with IPCC (2014) and UNEP (2016) reports that noted that impacts of climate change have been evident in the past few decades. Those impacts are also clearly evident in the Namibian context (Namibia

Ministry of Environment and Tourism 2011). Teachers thus noted that the content of climate change is important for the Namibian school Geography curriculum. These helps equip learners with skills to help combat climate change (Nhamo & Shava 2014). Education is an essential element of the global response to climate change (Anderson 2012). Teachers also recognised that the Namibian Geography curriculum considered not only the Namibian context; it also covers the global context. T2 observed:

> *Geography education in the Namibian context has to focus on raising awareness and informing learners about environmental degradation, climate change, species extinction, rising sea levels, excessive or unequal consumption, resource depletion and lack of wellness in our world, and not only as local problems but as a global predicament.*

In line with the above observation, there has been a great deal of recognition that environment and sustainability issues are global (IPCC 2014; UNESCO 2015). Learners therefore need to understand the nature of environmental issues, their associated risks and challenges at both local and global level (Hogan 2008). The aim of the Geography curriculum is thus to ensure that learners understand how these risks and challenges can be addressed on a personal, local, national, and global level and how they can play a part in addressing these risks and challenges in their own schools and local communities (Namibia Ministry of Education 2008; 2009). To help empower learners understand the global impacts of climate change, the curriculum covers topics that allows learners to understand climate change impacts at both national and global level (Namibia Ministry of Education 2008). For example, natural vegetation is a topic that is covered in the curriculum. The topic aims at enhancing learners' knowledge and skills on exploring the world's biomes and the impacts of climate change on these biomes.

## Challenges for Integrating Climate Change Content into the Namibian School Geography Curriculum

### *a) Geography Teachers' Pedagogical Content Knowledge on Climate Change*

Data from the interviews reveals that Geography teachers in Namibia were not

prepared to teach climate change aspects in the Geography curriculum. This was noted by T3 and T4 who said:

> *T3: I don't think teachers are well prepared to teach climate change in the Geography curriculum as little emphasis has been done on climate change. Teachers are not trained and some are probably not aware to what extent climate change can be taught. There are few teacher workshops given on Geography and even when they are offered, a lot of times, the people who facilitate these workshops only focus on how teachers can make passes and do not necessarily focus on how teachers can provide life changing education to learners.*

> *T4: Teachers are not prepared to teach climate change as a topic but rather prepared to teach topics that are directly related to Environmental issues, climate change is indirectly related to that. Very few materials exist to support teaching and learning in the classroom about climate change, especially in remote rural schools that don't have access to electronic content or internet; however, few printed materials are available.*

Even though climate change aspects have been integrated in the Geography curriculum, teachers were not well prepared to teach climate change content (Nhamo & Shava 2014). Teachers were trained as Geography teachers on the different topics in the curriculum, but they lacked the content knowledge of climate change (Zokka 2016). Teachers thus expressed in their interviews that they experience conceptual difficulties regarding teaching climate change. This resonates with Dube (2012; 2017; Anyanwu *et al*., 2015), who observed that in South Africa, Geography teachers lack conceptual understating on ESD. The two quotes from T3 and T4 above demonstrate the lack of teachers' content knowledge and knowledge of facts and concepts on climate change (Shulman 2004). Similar to Shulman, Ball *et al.* (2008) argue that content knowledge is foundational to teachers' competency. This implies that Geography teachers lacked the competency to teach climate change content in the curriculum (Wiek, Wathycombe & Redman 2011). Wiek *et al.* (2011) argue that teachers need to have different competencies for ESD. This was is in line with Hermans (2016), who noted that Geography teachers need different competencies to teach climate change topics. In terms of the Geography curriculum, different competencies will enable teachers to be able to assess

learners inquiry skills related to climate change. Those include questions that allow learners to organise and analyse information and to make judgments based on the information gathered (Namibia Ministry of Education 2008). This is because the subject matter related to climate change is complex and contested (Corney & Reid 2007). This was noted by T2:

> *Climate change concepts are difficult to understand, some learners are unable to use proper language. There is too much content to teach and it may require a lot of time to cover, it needs a lot of visualisation and technology to understand and some schools do not have such facilities.*

It is thus evident that Geography teachers expressed difficulties in teaching aspects of climate change in the curriculum. This was also demonstrated by their lack of pedagogical content knowledge to ESD. Dube (2012) suggested that ESD can benefit from Geography because of the approaches used to teach the content. Those include simulations, fieldwork, inquiry-based and problem-solving approaches to learning. Resonating with this, the Namibian Geography curriculum suggests the use of issue-based and inquiry-based approaches, including fieldwork activities (Namibia Ministry of Education 2008). Issue-based approaches enable teachers to focus on social and natural issues in local contexts (Simasiku 2012), whereas inquiry-based methods enable learners to think critically and to solve environmental issues in local contexts (O'Donoghue 2015). Despite the importance of inquiry-based and issues-based approaches to geographers, it emerged from the interview with the teachers that they did not use inquiry-based approaches in their teaching of climate change. This resonates with Simasiku (2012) and Zokka (2016), who observed that in Namibia, despite the fact that pedagogical approaches to environmental learning in Geography provides meaningful learning experiences to learners in the formal school context, they are rarely used. Their investigations confirmed that a number of structural and pedagogical factors need to be addressed to ensure the effective implementation of enquiry-based fieldwork in the Namibian Secondary school curriculum. Teachers need to engage learners in the field work/field excursion, this could be exposure to impacts of climate change in the local contexts (Dube 2012; 2017).

Even though inquiry-based and issues-based approaches were not commonly used to teach climate change content in the Geography curriculum, teachers were aware that the learner-centred education framework requires

engaging learners in teaching and learning (Namibia Ministry of Education 2009). Learner-centred education is a Namibian conceptual policy framework, which encourages learner participation and involvement in pedagogy. With regard to climate change, learner-centred education will promote critical thinking and problem solving skills in learners (Namibia Ministry of Education 2008). Learner-centred education sees a learner as an active, inquisitive human being, eager to learn, to investigate and make sense of his/her surrounding world (Namibia Ministry of Education 2009). To encourage learners' participation in learning, the teachers thus noted that they use a lot of discussions to teach aspects of climate change in the curriculum. As T1 revealed in the interview:

> *Using learners' experiences in the discussions on climate change, boils down to learner-centred education, the learners have ideas, it's not like they don't know what is going out in nature, if one have to look at climate change ... they can also learn from each other as they come from various parts of the country. For example, a learner coming from the coast will share the impacts of climate change at the sea, while the learner from the north will talk about drought and floods ….*

## *b) Geography Teachers' Context Knowledge on Climate Change*

Data from the interviews reveals that Geography teachers in Namibia lack the context knowledge on climate change. This was noted by T3 and T4 who said:

> *T3: For instance, we do not have enough knowledge when it come to examples of topics like impacts of tourism on the environment, or the use of modern technology, for example what type of modern technology they use to increase food production, learners need to know this knowledge on how they use tractors for ploughing maize and millet.*

> *T4: I would like to go for local ... for instance I cannot give an example of the effect of climate change on the Etosha Cuvelai Basin when learners do not know what the Etosha Cuvelai Basin is like ... that is why they say we should use our natural environment as a proper example in our teaching*

> *because if, for example, you are telling the learners about proper housing and they have never seen a proper house, it will be difficult for them to understand.. I would like to give examples of things that learners are familiar with.*

In support of the above observation, Hogan (2008) and Shulman (1986; 2004) highlights the use of everyday contexts and experience for meaningful learning. Hogan (2008) argues that using everyday contexts involve learners in classroom activities that increase learners' confidence in solving local issues. This allows learners to share responsibilities and to take control of their own learning. This is in line with the learner-centered approach being advocated for in Namibia. In relation to the Namibian learner-centred policy framework (Namibia Ministry of Education 2009), teachers also acknowledged in the interviews that they use local contexts to teach aspects of climate change.

### *c) Learners' Knowledge on Climate Change*

Despite the importance of engaging learners in teaching and learning, teachers recognised that learners lack knowledge on climate change as a challenge to integrating climate change in the Geography curriculum. As T1 and T2 observed:

> *T1: Learners struggle to understand this knowledge because they are not exposed, learners need to be exposed more to climate change through television and radio programmes. There is a need to discuss climate change topics in the newspapers, as well as more practical activities for learners on climate change.*

> *T2: Climate change concepts are difficult to understand, some learners are unable to use proper language and do not have an idea of what climate change is, and that climate change is happening…*

Resonating with the above observations and in addition to teacher context knowledge, Shulman (1986; 2004) argues that learners' general content knowledge is key to effective teaching and learning. This is central to the learner-centred policy framework in Namibia (Namibia Ministry of Education 2009).

The learner-centred education is devoted to encouraging learners to solve their own problems, to promote critical thinking, practical work and self-confidence. Central to learner-centred education is the assumption that knowledge is created by individuals through a process of making sense that involves establishing a link between prior knowledge and new information. The process happens both individually and socially by constructing, de-constructing and re-constructing knowledge (Namibia Ministry of Education 2009).

### *d) Other Challenges for Integrating Climate Change into the Namibian School Geography Curriculum*

In addition to the above, teachers mentioned other challenges for integrating climate change content in the Namibian school Geography curriculum. Those includes the lack of teachers ability to use global approach to teaching climate change, lack of access to visual teaching aids such as videos on local and global climate change issues, lack of textbooks, and access to technology, lack of support for teachers on climate change and overloaded Geography curriculum. Some of these challenges were revealed by T2, T3 and T4 as indicated below:

> *T2: Issues of climate change are not only local, they are global, however a lot of teachers have a little understanding on how to use global approach to teaching to raise awareness and to inform learners about environmental degradation, climate change, biodiversity loss, melting of ice caps, unsustainable consumption, resource depletion and lack of environmental wellness in our world.*

> *T3: Some schools have the necessary resources to teach but most schools have no facilities such as overhead projectors, teaching aids, visualizations or internet, this makes it difficult to play videos and expose learners to local climate change issues ….*

> *T4: I am not aware of any existing support offered to Geography teachers to aid effective teaching of the climate change content in the Geography curriculum …. Climate change concepts are difficult to understand and there is too much content in the syllabus which requires a lot of time to teach thus do not give teachers time to do research on climate change topics.*

The above observations have been observed by (Simasiku 2012; Nhamo & Shava 2014; Anyanwu *et al.*, 2015; Dlamini 2016; Zokka 2016). In relation to the challenges for teaching climate change aspects in theNamibian school Geography curriculum, teachers thus recommended the following:

- Adopting an interactive teaching and learning strategy and engaging leaners in the field work/field excursion;
- Providing quality and relevant teaching materials;
- Frequent continuous professional development activities focusing on climate change; and
- Implementing specific strategies and action plans for climate change education.

## Conclusions and Recommendations

The paper has explored climate change integration in the Namibian school Geography curriculum. It is evident that although the Namibian Geography curriculum has integrated climate change content, it is inadequate. It is further evident that there are various challenges hampering its effective curriculum integration. Evidence shows that the complex nature of climate change concepts hinders its effective integration. Other constraints include a lack of teachers' pedagogical content knowledge, insufficient quality teaching resources on climate change, learners' poor language skills and an overloaded curriculum.

To help take action to combat climate change and its impacts, there is a need for the Namibian Ministry of Basic Education, Arts and Culture to review the current Geography curriculum to include more climate change content. In collaboration with other stakeholders, the Ministry should provide professional development on climate change education for in-service teachers. This is to enhance Geography teachers' pedagogical content knowledge and understanding of climate change, such that they will be able to integrate topics on climate change in schools. There is also a need for teacher education institutions in Namibia to integrate climate change content in teacher education curricula. The paper further recommends provision of sufficient quality teaching materials on climate change. This could be from the Ministry of Basic Education, Arts and Culture and other stakeholders in education. The

Namibian government and the non-governmental sectors including the media should collectively strive to promote public awareness on climate change and its impacts. The media should be educated on how to cover relevant local articles on climate change. In conclusion, this paper calls for more research on professional support of Geography teachers on climate change in Namibia. Furthermore, with the implementation of the Sustainable Development Goals, there is a need to explore the nexus between Sustainable Development Goal 13 and teachers' pedagogical knowledge within Geography education.

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***Alter*nation Special Edition 21, 2018**
**Print ISSN 1023-1757; Electronic ISSN: 2519-5476**

Interdisciplinary Journal for the Study of the Arts and Humanities in Southern Africa

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