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The Changing Roles of South African Natural Science Teachers in an Era of Introducing a 'Refined and Repackaged' Curriculum
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KEYWORDS Teacher roles, curriculum, data coaches, classroom supporters

ABSTRACT For a curriculum reform to be a success, it should be done in concert with certain critical considerations such as the redefining of teacher roles. The purpose of the study is to establish teacher roles in implementing the Natural Sciences component of the Curriculum and Assessment Policy Statement (CAPS) in South Africa. The problem was based on challenges the Natural Science teachers encounter in implementing the refined and repackaged curriculum. This empirical study used a questionnaire, classroom observations and semi-structured interviews. The questionnaire had both closed and open-ended items. The sample consisted of 40 teachers purposively selected from schools in and around Mafikeng, North West province. Data were analysed using descriptive statistics and analytic induction. The study found that teachers are hungry for more workshops as it appears that only Department of Education officials harbour the knowledge of the refined and repackaged curriculum. On the ground, most teachers in the schools still teach Natural Science using the traditional method and do not have laboratory equipment and chemicals to conduct practical activities except micro-science kits that they use

mostly for demonstration purposes. Recommendations and possible ways that will help teachers redefine their roles for the refined and repackaged curriculum are suggested.

BACKGROUND AND RATIONALE

South Africa has recently revisited the National Curriculum Statements (NCS) introduced together with the Outcomes-Based Education philosophy in 2005, with a view to simplifying the original documents and the subsequent supporting documents (Subject and Learning Area Statements, Learning Programme Guidelines and Subject Assessment Guidelines) for all subjects. The aim was to produce national Curriculum and Assessment Policy Statements (CAPS) as a "refined and repackaged" version of the original documents, and not create new curricula (Vinjevold, 2012). The CAPS was introduced because, among other factors, evidence from the Trends in International Mathematics and Science Studies (TIMSS) for 1995, 1999 and 2003 indicated a poor trend in learner performance in South Africa. Furthermore, after years of pitiable performances in education rankings, South Africa finally hit rock bottom in an international measure of the quality of mathematics and science education (Gernetzky, 2012). According to Gernetzky, South Africa was last in the order of merit internationally, and was one of the countries that performed poorly in Grade 8 Science. These are some among many of the reasons which led to the refining and repackaging of the previous NCS curriculum.

The refining and repackaging of both the General Education and Training (GET) phase, Grade 8-9 and Further Education and Training (FET) phase, Grade 10-12 science documents was completed, and CAPS was launched at GET starting at Grade 8 level in 2012. Changes in classroom practices demanded by reform visions such as the shift from the NCS to CAPS ultimately rely on teachers (Fullan & Miles, 1992; Spillane, 1999). For a subject such as Natural Science, the CAPS specify the teaching time, content, skills, Learning and Teaching Support Materials (LTSM) needed and the assessment weightings and prescriptions. However, a great deal of commitment on the part of teachers is required if changes advocated by reform visions on the curriculum are to be a success. For example, the shift from the NCS to the CAPS in South Africa meant a change in teacher roles.

The term "role", as Dörneyi and Murphey (2003) point out, is a technical term "which originally comes from sociology and refers to the shared expectation of how an individual should behave.

In other words, roles describe what people are supposed to do" (109). Several methodologists (Bentley, Ebert & Ebert, 2000; Fleer & Hardy, 2001, Todd & Mason, 2005; Van der Horst & McDonald, 2003) have suggested many potential roles for a natural science teacher. Bentley, Ebert and Ebert (2000) conceptualize the role of the natural science teacher broadly as the "facilitator of learning" in the context of the constructivist approach and classroom practice instead of the rather narrow concept of the "teacher as instructor" (20). Martin et al. (1994) look at the term "facilitator" in a much broader way than Bentley et al. do, and point out that the teacher following a constructivist approach largely functions as a facilitator of knowledge construction and takes the following alternative roles: presenter, observer, question asker and problem poser, environment organizer, public relations coordinator, documenter of learning and theory builder (46-47). This reflects, as Bentley et al. (2000, 20) point out, "a widespread desire in the science teaching community to develop means of allowing learners to play a fuller, more active and participatory role in their science study".

Given that the current curriculum advocates for learning and teaching of science through inquiry (coming to know and understand the world through a dynamic process of being open to wonder and puzzlement), the role of the teacher should be looked at in the context of the notion of the learner-centred classroom, a kind of classroom in which the focus is on the active involvement of the learners in the learning process. Moreover, the role adopted by the learner in the classroom also hinges on the role adopted by the teacher (Choudhury, 2011). The role of the teacher in the classroom is of paramount significance as it is central to the way in which the classroom environment evolves. Therefore, teachers must be clear about their role in the classroom so that there is no chasm between their perceptions of their role and what they actually practice in the classroom. Of course, when we talk of the classroom role of teachers here, we take a restricted view of the role(s) of a teacher by focusing on what they do or should do inside the classroom only, leaving out of consideration the institutional or societal roles that they have.

Reddy (2006) says that when TIMMS results were analyzed nationally, it was found that in Natural Science, the North West Province was beaten by all the provinces except the Eastern Cape and Limpopo. A myriad of questions are raised pertaining to North West Province Natural Science teachers. For example: are the teachers prepared regarding methodologies incorporating learner involvement (inquiry-based approaches)? Are teachers competent enough regarding content knowledge, pedagogical knowledge and curricular knowledge? Has the Department of

Education (DoE) done enough in offering educator training in-service courses to win over the teachers as collaborators in the implementation of the curriculum? Are the schools well-equipped with apparatus and chemicals for teachers to implement the CAPS curriculum using desirable strategies? Does the curriculum present technological difficulties for teachers to comprehend? The major focus of the study is to try and answer these questions. Answering these questions can help educators craft pedagogies which are appropriate for involvement of learners in the teaching and learning of Natural Sciences, identifying challenges being faced by teachers in the implementation of the CAPS curriculum and suggest solutions to the challenges. This study therefore, investigates role(s) played by Senior Phase Science Educators in the implementation of the CAPS in Natural Science teaching. As already noted, the context chosen for this study is teacher roles in the teaching and learning of Natural Sciences at Senior Phase level in forty schools in and around Mafikeng, North West Province, South Africa.

RESEARCH QUESTIONS

The study is guided by the following research questions:

i) Which role(s) is/are played by Senior Phase Science teachers in the implementation of the CAPS in Natural Science teaching?

ii) What challenges are encountered by Senior Phase Science teachers in the implementation of the curriculum?

THEORETICAL FRAMEWORK

The guiding theoretical framework for this study is the basic principles of outcome-based education (OBE). According to Van der Horst and McDonald (2003), OBE constitutes the foundation of the South African curriculum approach and can be described as: a learner-centred, results-oriented approach to learning based on the beliefs or assumptions that all learners must be granted the opportunity to reach their full potential; that the learning environment should create a culture of learning, and that all stakeholders involved must be cooperating partners (5-6). The principal feature of OBE is a distinction between inputs and outputs (Chisholm, 2000). Outputs (also described as standards) are centrally designed and prescribed, while inputs are

discretionary, generated and managed locally. Inputs include what teachers and learners bring to learning, indigenous particularities and priorities, textbooks, management and support systems. Since these vary across learning contexts, the key input of what is taught and how it is taught should not be rigidly prescribed. This makes the *process* of learning in OBE to be considered as important as the *content*. By spelling out the content standards to be achieved at the end of the process, both the process and the content of education are emphasised. The content standards in the CAPS for example, are intended "to encourage a learner-centred and activity-based approach to education" (DoE, 2011, 11).

This is in line with Lorsbach and Tobin's (1997) idea, which states that teaching should be learner-centred and learners should be taught in an atmosphere of co-operation rather than a spirit of competition. Learners need an environment where everything in an educational system is clearly focused and organized around that which is essential for all of them [learners] to be able to do successfully at the end of their learning experiences. It is in these ideas that the OBE seems to share the same principles with constructivism - a philosophy whose seeds were sown by early thinkers Immanuel Kant, Henry James, Charles Sanders Peirce, and John Dewy. This is because constructivism shares the assertion that human knowledge and experience entails the active participation of the individual (Bishop & Denley, 2007). In particular, the social constructivist stance (Sebela, 2003), which has strong claims for deep and active learning. In social constructivism, learners are said to acquire knowledge by participation in authentic tasks situated in an environment that is permeated with "distributed" knowledge (Lave & Wenger, 1991). In other words, learning is seen as participation in a practice (participation metaphor) rather than as acquiring knowledge per se (acquiring metaphor) (Sfard, 1998) while at the same time recognizing that there is an ontological reality, which has been established by scientists by repetitive and routine confirmation.

A typical classroom setting consists of learners from various environments and, by implication, different *realities*. Cultural aspects thus become an important factor in constructing scientific knowledge. To be able to teach to bring out the best in learners, the teachers should have had knowledge of a variety of teaching and assessment strategies in order to provide multiple opportunities for learners to learn and demonstrate achievement. The constructivist perspective can have a profound influence on a teacher's approach to teaching science although teachers may not necessarily follow a deliberate constructivist approach to teaching science in their

classrooms. Research in South Africa (Bantwini, 2010; Bosman, 2006; Sedibe, 1998; Spady, 1998) conducted and based on the previous curricula (Curriculum2005 to the NCS) paints a very dull picture regarding learner-involvement. The role of the science teacher has been found to be that of teaching through the traditional method. Synonyms of the word *traditional* include words like: old, legendary, historical, handed down, customary, conventional, long-standing, established, etc. All these words could be used to describe the ubiquitous traditional method of teaching Natural Science in the previous curricula in South Africa. What, then, are the main features of this traditional method of teaching Natural Science? The traditional method is largely teacher-centred, with the teachers always hogging the limelight (Choudhury, 2011). They lecture at length on particular topics and learners listen to them with rapt attention – this has been the methodology for teaching Natural Science for decades now. To Freire (1982), this is called the "banking" system of education in which the learners are considered to be similar to bank accounts into which regular deposits are made to be drawn later for specific purposes like examination. The onus here obviously lies on the individuals making the deposits for it is they who are responsible for earning the money and it is only they who can make the bank accounts swell. Using this analogy for the traditional Natural Science classroom would inevitably mean that the teacher is a "sage-on-the-stage" using Billing's (2001:2) words, a metaphor for the traditional passive learning environment. The teachers here bear the burden of the whole class on their shoulders and the learner merely listens to the teacher and may be sometimes repeats or reacts to the teacher's directions.

The learner is reduced to play a passive, reactive role with no control over content or methods. To Choudhury (2011, 36), this "authoritative role (sometimes verging on the "autocratic" or the "authoritarian"!) of the teacher stems from the long-cherished traditional notion that pedagogic success depends on how articulately a teacher teaches". However, it is a fallacy to believe that learning depends on articulate or *eloquent* teaching for, as Kumaravadivelu (2006, 44) points out, "teaching, however purposeful, cannot automatically lead to learning for the simple reason that learning is primarily a personal construct controlled by the individual learner". For this reason, at best the teacher can create and maximize learning opportunities by involving the learners in the learning process because teaching and learning are essentially collaborative in nature. Choudhury (2011, 37) sums it all by saying "this is quite unlike what has always been traditionally considered sacrosanct - that teaching is basically the transmission of items of knowledge, and

learning accretion of them". The exact opposite is expected of the teachers in the CAPS curriculum. It is therefore important for teachers to consciously make a paradigm shift and introduce a child-centred approach to teaching and learning. This would include the use of practical work in teaching since the main aim of the curriculum is to produce a competent, independent creative learner who is also a critical thinker. As teachers have acquired the knowledge and understanding of the curriculum and its unfolding nature during pre-service and/or in-service training, they are expected to be in a position to interpret the stipulation of the policy document with insight and develop learning programmes that address the needs of the curriculum. Teachers need to understand the current classroom dynamics and be adept in adapting their roles to suit changing scenes. In this study, the investigated teacher roles include; instructional specialist-implementing effective teaching strategies (Marzano, Pickering, & Pollock, 2001), curriculum specialist-understanding content standards and how various components of the curriculum link together, as well as how to use the curriculum in planning instruction and assessment ensuring consistent curriculum implementation throughout a school), classroom supporter- implementing new ideas, often by demonstrating a lesson, co-teaching, or observing and giving feedback (Harrison & Killion, 2007) and data coaches (use that data to drive classroom instruction).

RESEARCH METHODOLOGY

Context and sample

The study which informs this article focused on teachers from twenty public schools in and around Mafikeng, the capital of North West province. The province has around 300 high schools. Just like other provinces of South Africa, the North West province is characterized by educational challenges that include the low educational standard in most schools, large class sizes, lack of infra-structure to support teaching and learning and teachers who do not have adequate subject knowledge. The other critical challenge faced by the province is the low pass rate of grade 12 learners in their school-leaving examinations (the Matriculation examination). This limits the number of learners going on to tertiary education. For all of these reasons, educational performance in the province is ranked among the lowest in the country.

The participants in this study were 40 Senior Phase (Grade 8-9) Natural Science teachers, two from each school. The teachers were purposively and conveniently sampled from 10 urban including township schools and 10 peri-urban including rural schools. Purposive in the sense that the researchers selected only those participants who were willing to participate in the study and who were accessible. Accessibility in this study refers to those participants who were willing to forgo their break and lunch time and avail themselves for interview and whose schools were reachable without much difficulty because of the poor condition of roads. Since the schools varied in their socio-economic status, it goes on to say the schools also differ in the teaching and learning challenges they confront. For example, some urban schools formerly known as Model C used to have the best resources and teachers and up to the present day some of these schools enjoy these priviledges. Township schools are mainly designated for blacks and located in townships. Townships are historic settlements designated for blacks and characterised by poor socio-economic conditions and poor education structure and resources. Most rural and townships schools are still characterized by the lack of adequate teaching and learning resources, aggravated by limited district support for schools and teachers and by other issues mentioned earlier on. These schools typically perform poorly, while learner achievement at urban schools, by contrast, tends to be better.

The study sample was balanced in terms of gender, 20 of the participants were male and 20 were female. The participants were between 25 and 50 years of age ranging between 2 and 25 years of teaching experience. Older teachers received their qualifications at teacher training colleges during the apartheid era. These colleges, especially those that were situated in the homelands, had deficiencies in the teaching of specific content knowledge, leaving their students with knowledge gaps. Some of these teachers went on to upgrade themselves professionally by taking in-service courses at universities after the closure of teachers' colleges, graduating with qualifications like Advanced Certificate in Education (ACE). Despite the upgrading, most teachers still have knowledge gaps since in-service courses at universities such as the ACE focus more on pedagogy rather than the content. Younger teachers who are receiving their qualifications only from universities as of late due to closure of teachers' colleges are not spared either of having knowledge gaps. They go through a curriculum designed in a manner not likely to equip the students with enough content knowledge. In other words, the students are churned out half-baked. Most of the teachers are under- and some even unqualified in the areas of

Science and pedagogical content knowledge. Most of the teachers were not specialists in teaching science education (physics, chemistry or earth science) though they were teaching it, mostly due to lack of teachers in mathematics and science subjects. The severity of the challenge has been evident in the learners' achievement outcomes, which are low in a subject such as Physical science as evidenced by its low pass rate.

Research Design and Methods

The study utilized mainly the qualitative method of data collection. A questionnaire which consisted of both closed and open-ended items, structured interviews and semi-structured observations were used. The use of these instruments was to enhance triangulation.

Questionnaire

The questionnaire contained open and closed items on school demography, teaching and learning support, preparation for teaching, lesson presentation, teaching strategy, assessment practice, teacher support and development, and problems teachers faced and suggestions on how to improve the situation. Closed questions consisted of the "yes" or "no" types followed by explain your choice. An example of one such question is; do you make use of the laboratory? Open-ended questions were adapted from literature (Tudor, 1993). The questionnaire had previously been validated by giving it to a different group of teachers from the same province who had been attending a professional development course. Both face and criterion validity were ascertained through this process. For content validity, the questionnaire was given to three professors in science education from a large research university. Corrections were suggested and implemented until all gave it a thumps-up. Schools were visited and permission sought to conduct the research. The respondents were made aware that participation was voluntary. Their anonymity was respected and confidentiality was assured (Resnick, 2007). All 40 teachers completed the questionnaire.

Semi-structured interviews

Six teachers (three males and three females) were sampled based on their responses to open-ended questions in the questionnaire and were interviewed using semi-structured in-depth interviews. The interviews specifically focused on the CAPS Natural Science curriculum and

their professional development. Their responses were audio-taped and later transcribed verbatim. Questions used in the interview were adapted from literature (Tudor, 1993). Examples of questions included: which different strategies do you use to teach Natural Science? How equipped are your school laboratories? etc.

Observations

The six teachers who were interviewed were also observed when teaching. The observations were non-participatory and semi-structured (Opie, 2004). Each teacher was observed twice. Before each lesson, the educator gave one of the researchers a copy of the lesson plan and supporting material. The observations were based on basic classroom dynamics, teacher and learner activities, and checking whether there were set objectives in the lesson plan, the types of questions used and assessment practices. Both researchers set at the back of the classroom recording field notes as observations were being made.

DATA ANALYSIS APPROACHES AND INTERPRETATION

Questionnaire

Closed items on the questionnaire generated data which was analyzed by means of descriptive statistics. Data from open-ended items was analyzed through analytic induction. This is the same method to which qualitative data from structured interviews and semi-structured observations were subjected.

Interviews and observations

Analytic induction was used to analyze data from interviews and observations. The researchers read through sets of transcripts making preliminary notes regarding patterns that emerged from individual participants. The transcribed data were read looking for patterns, relationships and other themes within the dimensions as those used to frame questions in the questionnaire. Entries were coded according to patterning identified while keeping a record of what entries went with which element of the patterns. These procedures involved (1) the simultaneous collection and analysis of interview and observation data and (2) comparative methods of analysis whereby participants' responses were compared between and within each participant, and (3) the

integration of a conceptual framework that guided the study. Underlying reasoning was then identified for each teacher by writing the category theme for each response and this enabled teacher roles to be determined for each teacher's response. Thus, some aspects of grounded theory analytical procedures (Strauss & Corbin, 1998) especially interpretive analysis (see, e.g. Gall, Gall, & Borg, 2003) were used to inductively analyze the participants' open-ended responses.

RESULTS AND DISCUSSION

In this section, the results are presented in the order of research questions. First, we address the first research question; which role(s) is/are played by Senior Phase teachers in the implementation of the CAPS in Natural Science teaching? In an attempt to explicate teacher roles, the second question is simultaneously addressed with the first. The findings are organized around four category themes covering each of the four teacher roles the study explored. Excerpts from completed questionnaires and interviews are used as evidence in support of the findings. Pseudonyms are used to protect the identity of the teachers and the schools. As we do that, we also reflect on some aspects from lesson observations and analysis of curriculum materials.

Teacher as an instructional specialist

One of the roles of a teacher is to see that effective teaching strategies are implemented (Marzano et al., 2001). The questionnaire had nine (9) teaching strategies from which teachers had to choose the ones they use when teaching Natural Science. These are; telling method, group work, whole class discussion, problem solving, co-operative learning, experimentation, worksheets, projects and presentations. Table 1 gives a summary of teachers' responses on closed items on teaching strategies.

Insert Table 1 here

A glance of Table 1 attests to the general perspective that the majority of the teachers (85%) in this study used at least different teaching strategies when teaching Natural Science. This is impressive and gratifying since most of the teaching strategies the teachers indicated they are

using are learner-centred and adhere to the results-oriented approach to learning based on beliefs or assumptions that all learners must be granted the opportunity to reach their full potential. However, lesson observation data do not appear to show that the teachers used different teaching strategies for their teaching at all. For all the 12 lessons observed, the telling (traditional) method which is largely teacher-centred, with the teachers always hogging the limelight (Choudhury, 2011) dominated. The teachers lectured at length on particular topics and learners were listening to them with rapt attention. The learners were reduced to play a passive, reactive role with no control over content or methods (Choudhury, 2011). For interest's sake even topics such as chemical reactions, oxides and reactions of metals with oxygen, electrostatics, electrical systems including series and parallel connections were taught mostly using the traditional method. Here and there, teachers would be seen trying to use group work but groups would have at least 8 learners in each group. This would reduce the group work approach to merely nothing more than child's play. Most of the learners would not be meaningfully involved compromising the quality of learning. During interviewing, when asked to explicate the different teaching strategies they use, two of the teachers said,

> …to tell you the truth, I predominantly use the telling method. As much as I would want to vary the different teaching strategies, the class sizes are too big and do not allow for that. I also do not have the apparatus and simple chemicals. All we have at the school are micro-science kits and the best we can do is just teacher-led demonstrations. Most of us teachers need training in this CAPS curriculum […] (Teacher 1, School 17).

> …I teach mostly using 3 teaching approaches. These are the telling method, demonstration and the project methods. The main reason for this is because we lack basic chemicals and apparatus at the school. We only have micro-science kits for demonstration purposes. The project method is a "must use" for a certain topic as prescribed by the Department of Education so I just rarely use it (Teacher 2, School 9).

Teacher as a curriculum specialist

The role of a teacher under this category is that of understanding content standards and how various components of the curriculum link together, as well as how to use the curriculum in planning instruction and assessment ensuring consistent curriculum implementation throughout a school. Closed items on the questionnaire asked questions related to issues of teacher support

and development for effective curriculum implementation. Most of the teachers (85%) agreed that the Department of Education organized workshops for them on the implementation of CAPS. The teachers also said they use different forms of assessment as follows; homework (98%), assignments (98%), classwork (90%), demonstrations (83%), projects (98%), experiments (80%), investigations (95%), case studies (80%). After going through curriculum materials, the researchers confirmed that the teachers used all other forms of assessment except experimentation. Open-ended responses on the questionnaire spelt out clearly that the teachers only get to know how various components of the curriculum link together when they attend workshops arranged by the DoE. Three of the teachers wrote,

…we are taught how to interpret the CAPS curriculum during workshops by officials from the DoE. They teach us how to plan and assess as well as specify various recommended and prescribed activities (Teacher 7, School13)

…all the training pertaining to curriculum interpretation, implementation and assessment is shared to us by officials from DoE (Teacher 6, School 4)

…when it comes to the understanding content standards and how they link with various components of the curriculum, the DoE officials train us mostly during our school holidays (Teacher 10, School 15)

Interviews also confirmed that workshops organized and run by officials from DoE for now are the only sources that provide the necessary knowledge to the teachers for their role as curriculum specialists. Two of the teachers said,

…in February 2013, we attended workshops in Rustenburg for a week on how to use practical work when teaching Natural Science. The workshops were eye opening and I learned a lot. If we would have more of those workshops I would be a better teacher. We also need constant supply of chemicals and apparatus if we are to perform experiments with learners. We also have had several workshops on content and assessment. The DoE is trying its best […] (Teacher 5, School 4)

…I am a bit frustrated and demotivated with the Department of Basic Education. Just when we thought we had come to terms with the previous curriculum-the NCS, in comes this CAPS curriculum. We are never on top of the situation and we are always found wanting. This is frustrating […]. We are never consulted when they make these curriculum reforms but we are expected to implement the curriculum diligently (Teacher 3, School 17)

Teacher as a curriculum supporter

When teachers assume the role of curriculum supporter, they implement new ideas, often by demonstrating a lesson, co-teaching, or observing and giving feedback (Harrison & Killion, 2007). All forty teachers who took part in this study found this as a demanding task to assume. All the participants alleged that the environment in the schools do not allow them to act as curriculum supporters. All participants said they do not take part in co-teaching because teaching in their schools is structured in such a way as not to temper with the status quo. Despite benefits of co-teaching such as more detailed observation of learners engaged in the learning process occurring regardless of models of co-teaching individuals use (Cook & Friend, 2004), the teachers are not practicing it. One teacher said,

> …it is difficult to try something new given the nature of timetables in our school. Each teacher is pre-occupied with his or her own work. If you go to colleagues and suggest issues of co-teaching, they just look at you and wonder if all is well with you. The best we can do is demonstrating a lesson if we can get the apparatus or chemicals for an experiment, otherwise, you cannot be seen observing or giving feed back to a colleagues' lesson. It will be like poking your nose into someone's business (Teacher 11, School 20).

Teacher as an instructional specialist

As data coaches, teachers have access to a great deal of data which they can use to drive classroom instruction (Harrison & Killion, 2007). Just like in the preceding paragraph, the teachers also lamented on lack of engagement with their peers in analyzing and using a great deal of data at their disposal to strengthen instruction. The teachers indicated great desire in guiding each other to discuss strengths and weaknesses of learners' performance in science as a group, as individuals, by classrooms and in disaggregated clusters by gender and so forth so that they could plan instruction on the basis of this data. However, the teachers expressed grief over a number of challenges including number of too many learners in classes, too much paperwork to deal with and lack of regular workshops from subject advisors. All forty teachers indicated on the questionnaire that they do not engage in this role at all in their school. Perusal of curriculum material like lesson plans given to researchers also attested to this. Furthermore, classroom

observation confirmed this. Teachers were seen busy with their learners with the traditional method of instruction dominating. Two of the teachers said,

…we usually come together as teachers for all subjects offered in the school towards the end of the year when we discuss learners' performances for purposes of promoting the learners to the next grade level. Never have we done this for purposes of informing instruction (Teacher 4, School 9).

…we don't have time for such activities. It will be good and noble, it's ideal but where in the world do we get time to do that. We are overloaded. Time does not allow us to act as data coaches at all […] (Teacher 9, School 15).

LESSONS LEARNT AND IMPLICATIONS

It is not to be disputed that reforms are indispensable and inevitable, as they bring hope for the desired educational changes. This study endorses the notion that curriculum reform is a very complex exercise (Fullan & Miles, 1992), and requires to be connected to all aspects of teaching and learning. As Gamoran (1997) clearly puts it, curriculum reforms have important benefits, but they must occur in concert with other social changes in order for them to have a significant and long-lasting effect. From the study, it is evident that certain critical considerations were neglected and these required attention in concert with the launch of the refined and repackaged CAPS curriculum. These included contextual factors such as teachers' workload, a lot of paper work for teachers and classroom conditions such as teacher to learner ratio. The advocated teacher to learner ratio is one teacher is to 30 learners at secondary school. This ratio is still unattainable at Senior Phase, the level at which learners require more attention and where strong educational foundations can be laid especially when it comes to science concepts. The high teacher to learner ratio makes it difficult for teachers to implement different strategies when teaching Natural Science. Teachers also find it difficult to offer guidance to individual learners to fulfil principles advocated by OBE. The lack of appropriate teacher orientation to the reforms was found discouraging and teachers lose motivation. The refining and repackaging was carried out over a short period, depriving teachers of sufficient time to discuss and consider implementation of the curriculum in their classes. It is recommended that in future more time

should be given for teachers to discuss incoming curriculum so as to encourage and motivate them.

Evident from these findings is that the quality of the refined and repackaged curriculum on its own does not guarantee a successful reception by teachers, and neither the redefining of teacher roles for its successful implementation in the various classrooms. Neglect of these issues creates frustration and sends out a message that the DoE lacks concern about its teachers and can aggravate the gap between conception and reality, between political symbolism and implementation as noted by Lemon (2004). These problems, he believes, derive from the frustration of pursuing idealistic aims that are often based on what is regarded as good practice in most developed countries without the human or financial capacity to achieve them. Thus, we need to guard against viewing curriculum reforms as a 'quick fix' solution to existing challenges, but rather as a long-term solution. The DoE needs to maintain a close working relationship with the teachers so that they can identify and learn about teachers' difficulties relating to the reforms hence, is important to learn about and understand teacher roles in implementing the CAPS curriculum. It is also imperative to check continuously where teachers stand in their understanding of the reforms. In this way, teachers are kept accountable and given a chance to re-think the reforms and redefine their roles. Teachers sometimes miss capturing the goals and visions of refining and repackaging curricular because of the way in which the new messages are introduced to them. Also, when teacher roles in advancing education is recognized through involvement in the processes that discusses new reforms, they are likely to take ownership of the reform process (King & Newmann, 2000) and that will ensure their success. In future, teachers can be asked to appoint a group of teachers who will liaise between them and the policy makers when considering refining and repackaging of existing curriculum. This will keep teachers informed of the processes being followed and should make more likely their taking ownership of the adopted curriculum.

CONCLUSIONS AND RECOMMENDATIONS

All reforms in education will face challenges, whether contextual, cognitive or otherwise (Bantwini, 2010). The launch of reforms such as the introduction of the CAPS must take these challenges into consideration and they should be treated positively. Plans should also be made to

resolve the challenges concurrently with the implementation of the reforms. Teachers are also hungry for more workshops as it appears DoE officials harbour the knowledge of the refined and repackaged curriculum. Hence, DoE should invest significantly in continuous professional development, provide support structures, monitoring and evaluation, and promote teacher collaboration within the schools. This should ensure that teachers develop the appropriate understandings of the refining and repackaging so as to immediately redefine their roles, as well as quickly receive necessary help whenever challenges arise. Teachers should be given adequate apparatus and chemicals to use in the schools so that they can implement all teaching approaches advocated by the OBE philosophy and forgo or use the traditional method at a minimum which they have been using for decades.

REFERENCES

Bantwini BD 2010. How teachers perceive the new curriculum reform: Lessons from a school district in the Eastern Cape Province, South Africa. *International Journal of Educational Development*, 30, 83–90.

Bently M, Ebert C, Ebert ll ES 2000. *The Natural Investigator: A Constructivist Approach to Teaching Elementary And Middle School Science*. Wadsworth: Thomson Learning.

Bishop K & Denley P 2007. Biology. In Bishop, K. (Ed.). *Learning science teaching: Developing a knowledge base* (85-97). Maidenhead: Open University Press.

Bosman Linda 2006. The value, Place and Method of Teaching Natural Science in the Foundation Phase. Unpublished Master dissertation. Pretoria: University of South Africa. [Online]. Available url: http://uir.unisa.ac.za/bitstream/handle/10500/2345/dissertation.pdf?sequence=1. Accessed 3 January 2011

Chisholm L 2000. *Report of Curriculum 2005 Review Committee*. Pretoria: Government Printer.

Choudhury AS 2011. Classroom roles of English language teachers: The traditional and the innovative. *Contemporary Online Language Education Journal*, 1, 33-40.

Cook L, Friend M 2004. *Co-Teaching: Principles, Practices, and Pragmatics*, Albuquerque, NM.

Dörneyi Z, Murphey T 2003. *Group dynamics in the language classroom*. Cambridge: Cambridge University Press.

Freire P 1982. *Pedagogy of the oppressed*. Harmondsworth: Penguin.

Fullan MG, Miles MB 1992. Getting reform right: What works and what doesn't. *Phi Delta Kappan*, 73, 745-752.

Gall MD, Gall JP, Borg WR 2003. *Educational research: an introduction* (7th ed.). Boston: Allyn and Bacon.

Gamoran A 1997. Curriculum change as a reform strategy: lessons from the United States and Scotland. *Teacher College Records*, 98(4), 608–628.

Gernetzky K 2012. South Africa bottom of class in maths and science. [Online]. Available url: http://www.bdlive.co.za/national/education/2012/10/31/south-africa-bottom-of-class-in-maths-and-science. Accessed 19 June 2013.

Harrison C, Killion J 2007. Teachers as Leaders. *Educational leadership*, **65**(1), 74-77.

King BM, Newmann FM 2000. *Will teacher learning advance school goals?* Phi: Delta Kappan.

Kumaravadivelu B 2006. *Beyond methods: Macrostrategies for language teaching*. New Delhi: Orient Longman.

Lave J, Wenger E 1991. *Situated Learning: Legitimate Peripheral Participation*. Cambridge: University of Cambridge Press.

Lemon A 2004. Redressing school inequalities in the Eastern Cape, South Africa. *Journal of Southern African Studies* **30**(2), 269–290.

Lorsbach A, Tobin K 1997. Constructivism as a referent for science teaching.[Online]. Available url: http://www.exploratorium.edu/ifi/resources/research/constructivism.html. Accessed 13 July 2010.

Marzano R, Pickering D, Pollock J 2001. *Classroom instruction that works*. Alexandria, VA: ASCD.

Opie C 2004. *Doing Educational Research: A Guide to First-Time Researchers*. London: SAGE Publications.

Resnick D 2007. What is ethics in research & why is it important? [Online]. Available url: http://www.niehs.nih.gov/research/resources/bioethics/whatis.cfm. Accessed 15 May 2013.

Sebela MP 2003. Using Teacher Action Research to Promote Constructivist Classroom Learning Environments in Mathematics in South Africa. Unpublished doctoral thesis (PhD). Perth: Curtin University of Technology

Sedibe K 1998. Dismantling Apartheid education: an overview of change. *Cambridge Journal of Education* 28(3), 269–281.

Sfard A 1998. On two metaphors for learning and the dangers of choosing just one. Educational Researcher. *Educational Researcher,* 27(2), 4-13.

Spady W 1998. South African Outcomes-based education: an international perspective. In Gultig, CLJ, Wedekind B & Parker, V (Ed.), *Understanding Outcomes-based Education: Teaching and Assessment in South Africa*. Cape Town: Institute for Distance Education and Oxford University Press.

Spillane JP 1999. External reform initiatives and teachers' efforts to reconstruct practice: The mediating role of teachers' zones of enactment. *Journal of Curriculum Studies,* 31, 143-175.

Strauss A, Corbin J 1998. *Basics of qualitative research: Grounded theory, procedures and techniques.* Newbury Park, CA: Sage.

Todd A, Mason M 2005. Enhancing learning in South African schools: strategies beyond outcomes-based education. *International Journal of Educational Development*, 25, 221–235.

Tudor I 1993. Teacher roles in the learner-centred classroom *ELT Journal*, 47(1), 22-31.

Van der Horst H, McDonald R 2003. *Outcomes-based Education: Theory and Practice*. Pretoria: Tee Vee Printers.

Vinjevold PA 2012. *Annual Report 2011/2012- Department of Education*. Cape Town: Western Cape Provincial government.

Table 1: Use of teaching strategies

Teaching strategy	Number of teachers who use the strategy (Number as %)	Number of teachers who do not use the strategy (Number as %)
Telling method	19 (48)	21 (52)
Group work	36 (90)	4 (10)
Whole class discussion	37 (93)	3 (7)
Problem solving	34 (85)	6 (15)
Co-operative learning	36 (90)	4 (10)
Experimentation	34 (85)	6 (15)
Worksheets	35 (88)	5 (13)
Projects	34 (85)	6 (15)
Presentations	37 (93)	3 (7)