

DO IMBALANCES OF THE PAST COUNT ANYMORE? TEACHING PRACTICES OF TWO PHYSICAL SCIENCES TEACHERS IN TWO SOUTH AFRICAN HIGH SCHOOLS

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ABSTRACT

The purpose of this study is to examine the teaching practices of two Physical Sciences teachers from two high schools in the North West province of South Africa. The teaching practices of the two teachers were established based on the National Strategy for Learner Attainment (NSLA) framework objectives so as to improve learner attainment in Physical sciences. Schon's (1983) reflection-in-action and reflection-on-action constructs which are pivotal to practitioner inquiry were employed as a conceptual framework for this study. The exploratory case study was purely qualitative and used collaborative educational inquiry in the form of participatory action research by university academics and school-based teachers. The cases focused on two teachers from two former model C schools who were purposively sampled. Data was generated through interviews, classroom observations and teacher-reflective journal entries. Data was thematically analysed using three stages of coding: open, axial and selective coding. Results of the study demonstrate creative resource provision, niftiness in the nature of classroom activities and ingenious reflection practices. Indeed imbalances of the past still count as former model C schools suffer with respect to scant resource provisioning. Recommendations for policy and further research are suggested.

Keywords: Physical sciences teachers, instructional teaching practices, reflection-in-action, reflection-on-action, National Strategy for Learner Attainment (NSLA) framework.

1. INTRODUCTION

In trying to address imbalances in the South African education system, the introduction of the current curriculum document (CAPS) is one of several significant curriculum reforms since 1994, which are generally aimed at "redressing the inequalities and injustices caused by the apartheid regime policies, using education as its tool" (Bantwini, 2010:84). However, outdated instructional teaching practices and lack of basic content knowledge have resulted in poor teaching standards in the South African education system (Makgato & Mji, 2006). Instructional teaching practices in this study refer to the activities that teachers carry out in classrooms. Instructional practices are often classified into two types: teacher directed or constructivist. This binary classification depends on whether the instructional format is teacher-centred (direct instructional practices) or student-centred (constructivist teaching practices). The orientation of instructional practice plays a pivotal role in the learning process (Soto-Calvo, Isac, Araújo, Costa & Albergaria-Almeida, 2015). According to Palardy and Rumberger (2008), instructional practices consistently predict students' learning outcomes and their effects have been shown to be larger than teachers' background, qualifications or their beliefs and attitudes.

Research studies focusing on teacher instructional practices specifically of former model C schools (Radebe, 2016) in the teaching and learning of Physical sciences in South Africa has been very scarce. There has been enduring neglect of research channelled to bring about a nuanced understanding of teaching practices from such schools, with prominence and focus given to practices of teachers in poor performing schools. The main reason for this neglect is the excellent Grade 12 results which have been consistently produced by the former model C schools. Lately, former model C schools have been 'bullied' into accepting more learners than was hitherto the practice (Child, 2017). This is despite former model C schools typically getting the lowest subsidies per pupil from the Department of Education and paying for their own water and electricity bills, maintenance costs and insurance bills, employing extra teachers to

make the class sizes manageable and buying extra textbooks (Child, 2017). In view of the historical inequalities of the South African education system, it is not the purpose of this article to focus on the shortcomings by delving into different types of schools in the education sector, but report a case study investigation that interrogates the instructional teaching practices of two Physical sciences teachers in two former model C schools in 2017. The teaching practices of the two teachers were observed and scrutinised under the benchmark of the NSLA framework that has been designed to improve learner attainment in Physical sciences.

1.1 Background to the study

In order to fully understand the background in which this study was undertaken, it is necessary to describe the context in which this research took place. Prior to the institutionalisation of apartheid, schools were operated by churches and provincial authorities (Alexander, 2009). Unequal education existed during these times (Waller & Maxwell, 2016). According to Alexander (2009), South Africa had 15 different education authorities and in the case of the North West Province there were six different education authorities. The curriculum of each of the nineteen different educational departments separated by race and geography played a powerful role in entrenching and reinforcing inequality and imbalances.

In 1994 the democratically elected government in South Africa inherited a divided and unequal system of education. According to Badat (2011), the new democratic government brought with it a desegregated national education system that resulted in an influx of large numbers of black learners into the formerly white schools and none of them could be refused admission on the grounds of their inferior basic education. In order to realise social equity and redress for historically disadvantaged social groups in education, it was imperative to overhaul admissions, and this decision has loomed large in policy discourse (Badat, 2011). The new educational system sought to stop rewarding people in relation to the colour of their skin. It was a standpoint that fought to ensure that resource-distribution was unbiased. Waller and Maxwell (2017) lament that unfortunately, steps were not taken to fulfill the promise proclaimed within the post-apartheid era reform hence promulgation of the aforementioned stereotype images. Thus funding for schools had to be prioritised and channelled towards schools situated in previously disadvantaged communities.

In light of this background, the pedagogical goal of this study was to explore instructional teaching practices of two teachers from two former model C schools regarding teachers' role, nature of classroom activities, nature of reflection practices and stakeholder involvement levels, in order to make an improvement of learner attainment in the North West province of South Africa. Such an inquiry was also designed to establish if imbalances of the past still count. Given numerous challenges facing educators today that relate to a new didactic and methodological approach based on innovative proposals for science teaching (de Medeiros-Silva, de Oliveira, & de Oliveira, 2017), the next section focuses on playful teaching as part of school science.

1.2 Playful teaching as part of school science

The school environment needs to be part of a social context that should be meaningful, pleasurable and dialogical, encouraging learners to actively participate in the development of their own learning (de Medeiros-Silva et al., 2017). Learning through play (also known as role playing) is a basic engagement and should not be considered just as fun but as part of the learning process (de Medeiros-Silva et al., 2017). A study by Fogg (2001) reports that learning through play raises learner interest in the topic. According to Poorman (2002:32), "integrating experiential learning activities in the classroom increases interest in the subject matter and understanding of course content." Learning through play provides the learners with the opportunity to construct knowledge in an interactive and participatory manner.

Role-play has also been effective in reducing racial prejudice (McGregor, 1993). Learning through play improves interpersonal skills, communication skills and enhances communication (de Medeiros-Silva et al., 2017). When used in a school setting, learning through play allows learners to extend their knowledge of a subject by researching a character within a given topic.

2. Research Questions

The purpose of the study was to establish the teaching practices of two teachers purposively selected and benchmark their practices against the NSLA framework as a way to improve learner attainment in Physical sciences. The research questions addressed in this paper are: (i) what teacher practices are observed in Physical sciences classrooms in selected former model C schools in the post-apartheid era of South Africa? (ii) what is the role of teachers, the nature of classroom activities, the nature of reflection practices and stakeholder involvement in making high learner attainment a reality in these classrooms?

3. Conceptual Framework

Schon's (1983) reflection-in-action and reflection-on-action constructs which are pivotal to practitioner inquiry were employed as a conceptual framework through which the research could be understood. Reflection-in-action is 'action present' and it is described by Schön (1983) as reflecting on the incident whilst it can still benefit that situation rather than reflecting on how one would do things differently in the future. In layman's language, reflection-in-action refers to thinking while doing. As revealed by Schön (1983), surprising incidents occur because in a new situation people use knowing-in-action (knowledge that one would have gained in other/similar situations) that are inappropriate for the current (unique) situation. Smyth (2001) builds on the work of Schon and suggests three questions to guide the reflection and action process. These questions include: What do I do? (Describing); What does this mean? (Informing); and How might I do things differently? (Reconstructing).

On the other hand, Schön's (1983, p. 26) reflection-on-action involves reflecting on how practice could be developed (changed) after the event. 'We reflect *on* action, thinking back on what we have done in order to discover how our knowing-in-action may have contributed to an unexpected outcome. In essence, reflection after the event focuses on how our knowledge of previous similar events might have led to the unexpected incident and what we need to change for the future. In layman's language, this refers to after-the-event-thinking. Three steps are involved in such a process. Firstly, one chooses an incident. This could be something that one experienced in a placement or a component of one's academic skills, which one feels has not been happy with the outcome. It is akin to Schon's 'experience of surprise' (what Boud & Fales, 1983, identify as 'a sense of inner discomfort' or 'unfinished business'). Secondly, one thinks about what the situation was like before the intervention and what it was like afterwards.

The final step is where the individual summarises the whole situation. What are the key points from one's reflection-on-action? What has one learnt that developed one's knowing-in-action? What would one do differently? According to Atkins and Murphy (1993), the final step of reflection involves the *development of a new perspective*. The argument pursued here frames the study that professional practice is complex, unpredictable and messy (Schön, 1983). Meanwhile, teachers draw on both practical experience and theory as they think on their feet and improvise. Subsequently, they act both intuitively and creatively. Finally, both reflection-in and on -actions allow them to revise, modify and refine their expertise.

4. Methodology

This qualitative study used collaborative educational inquiry in the form of participatory action research by university academics and school-based teachers. Action research incorporates 'self-reflective enquiry' (Carr & Kemmis 1986:162) undertaken by participants in specific social situations, including schools and classrooms. Action research recognises the centrality of practitioners to the research process and seeks to improve pedagogical practices and justice implications of these practices in the situations where they are enacted (Levin & Greenwood, 2011). Reflection is central to the action research process (Goodyear, Casey & Kirk 2013). An exploratory case study was adopted, which according to Basit (2010), supports the production of detailed accounts and deeper considerations of actions, experiences and perceptions. This case study investigated the enactment of redesigned pedagogical practices and subsequent reflections and meaning-making.

4.1 Sample

Participants. The two former model C public high school Further Education and Training (FET) teachers and one Grade 12 class from each school participated in this study in collaboration with the university-based authors, as critical friends. Each school had one Grade 12 class specialising in Physical sciences. One teacher was a white lady of 31 years who in this study was named Biggie (pseudonym-not her real name). Her Grade 12 Physical sciences class has 28 learners. Her school was situated on the outskirts of a small town some 60km from the provincial capital of the North West province. The school was formerly a whites only school but now it enrolls learners from all races, creeds and cultures. Of the 28 learners 10 were Black, 13 were White and 5 were Indians. The other teacher was a black male aged 44 named Masego (pseudonym-not his real name) who taught at suburban school. His Grade 12 Physical sciences class had 33 learners. All the 33 learners were Black. The two schools sampled in this study were characterised by moderate class sizes, a trend still existing in most former model C schools. The sample was purposively selected from one district of the North-West province of South Africa which was deemed to be performing well and contributing significantly to the overall performance of the province in matriculation examinations. Purposive sampling is a non-probability sampling method whereby only those people a researcher thinks would provide the relevant information are selected. In this case, former model C schools consistently producing a pass rate of over 90% were selected.

4.2 Research Methods

In order to capture the lived experiences, perspectives and knowledge generated by two teachers - Biggie and Masego - classroom observations and semi-structured interviews as 'extended conversations' (Holland & Ramazanoglu, 1995) were organised on a regular basis (one interview per three weeks) over a school term period (3-months) resulting in eight interviews (4-each) in all. The study involved two teachers from two former model C schools. Biggie and Masego aimed to sustainably improve learner performance (tests and the examination), protect time for teaching and learning, improve support for teaching and learning, and resource provisioning as these were areas of difficulty which most significantly impacted on learners' success. These are also DoE's 2015 NSLA framework objectives. Learners' work samples, photographs and collected comments provided sources of additional and complementary data. A number of quality measures for qualitative studies which include credibility, transferability, trustworthiness and confirmability were used. Firstly, credibility was ensured by providing thick descriptions of research participants' responses and the data collection methods. Secondly, the trustworthiness was ensured through the use of more than two data collection tools through a process called triangulation. Lastly, the confirmability of the study findings was achieved partly through triangulation and member checking. The findings from the participants were taken back to the teachers to confirm the data collected.

4.3 Data Analysis

Data gathered were thematically analysed using three stages of coding: open, axial and selective coding (Neuman 2011). For open coding, initial themes and codes were assigned to the data in order to condense the mass of data into categories. Codes were identified based on questions from the diary entries, observation schedule and interview schedule, which were designed with the research question in mind. Subsequently, for axial coding, codes were linked and key analytical categories discovered. Finally, selective coding was performed.

5. Results and Discussion

The two teachers commenced by identifying 'uncomfortable feelings' and thoughts regarding issues, factors and possible solutions related to their teaching practices which were presenting a 'sense of inner discomfort.' Smyth's (2001) questions provided guidance in identifying and clarifying issues, contributing factors and possible actions. Specifically, regarding 'a sense of inner discomfort', Biggie and Masego identified issues around improving learner performance in Physical sciences. Biggie indicated: *"My predecessor had a 100% pass rate and I was not sure if I would maintain it with the calibre of learners I have this year. ...and I asked myself, what professional imperative should I undertake? After a week of thorough introspection, I settled on reflective practice..."* Masego indicated: *"My learners' performance was not that bad. Generally in Physical sciences the pass rate at the school has always been above 80% for the past 3 years. I wanted a higher pass rate than the one for the previous year. ...I took the issue of my learners' performance as a problem and wanted to know how I could improve the results through reflective situations."*

Possible solutions for the two teachers were in the form of pedagogical restructuring. This would relate to Smyth's (2001) two questions: what does this mean? And what do I do? As can be seen from the data, the two teachers considered reflection to stem from doubt, hesitation or perplexity related to a directly experienced situation (de Medeiros-Silva et al., 2017). The findings of the current study are consistent with those of Poorman (2002) who found *uncomfortable feelings* and thoughts regarding issues prompted purposeful inquiry and problem resolution.

The second theme, 'a critical analysis of feelings and knowledge,' related to improving support for teaching and learning and resource provisioning. The two teachers had to respond to their inner sense of discomfort. This was through asking themselves a series of technical, practical and critical questions to engage with. During reflection for action the two teachers considered their resources; how to make the resources relevant to the different learning styles (practical) they were going to use; and to question why they were going to teach particular topics (critical) in a way they proposed and the time for each lesson (technical). Both teachers settled for *playful teaching as part of school science* (commonly known as role play). Looking at the resources, both teachers indicated that their schools being former model C schools no longer received science equipment. During interviews Biggie said: *"It is even difficult with replenishables. At times I use my own money. The school does not have a budget for chemicals. ... It is difficult to teach at a former model C school, people still think we have everything we need as before. Parents in my Grade 12 class purchase the books for their learners"*. Role play was adopted as a teaching strategy to act as sort of intervention by the two teachers. In contrast to earlier findings by Radebe (2016), however, no evidence of best resources at former model C school was found in this study except for best teachers. A possible explanation for this might be teachers go an extra mile in their work. The development of a new perspective is the third theme emerging from this study. In essence it summarises the whole situation. During interviews, the two were asked what they had learnt that developed their knowing-in-action. Biggie responded by saying, *"I used to wonder when learners came to me complaining that Physical sciences is a difficult subject. Now I can relate this to mismatch between the theoretical demands of the subject and the pedagogical practices I have been using."* Role playing seems to have

worked for both teachers. The teachers acknowledged that learners had improved their research, communication and interpersonal skills. Biggie also acknowledged that White, African and Indian learners were working together in a collegial manner. This finding corroborates the ideas of McGregor (1993) who noted that role-playing has also been effective in reducing racial prejudice.

6. Conclusions and Recommendations

From the results presented and discussed, there was transition from direct instructional practices to constructivist teaching practices primarily through use of playful teaching (role play) in the teaching of Physical sciences by the two teachers. Using role play as a teaching strategy defined teachers' instructional practices in the study, with teachers realising the need of not just being knowledge transmitters but facilitators who allow learners to question, investigate and interact. Another interesting finding was that through the playful teaching as a strategy, racial prejudice was reduced in one of the multi-racial schools which took part in the study. Reflective practices were appropriately ingenious and parents play a great role as stakeholders in filling the role that is supposed to be played by the Department of Education in one of the schools. The title asks: Do imbalances of the past count anymore? The answer is that imbalances of the past still count in post-apartheid South Africa. The two former model C schools do not receive science equipment from the Department of Education. The reasons might be that, for now, focus is on equipping old and new schools in formerly disadvantaged communities. Model C school teachers have to improvise. This study has demonstrated that critical feature of the *context* of reflection is a limitation of the study. While these two cases were limited by the small sample of two teachers, it does not claim to provide generalisations that are representative of all former model C schools. The study recommends that Department of Education should treat former model C schools just like any other school despite having benefited prior 1994 era. Further research should be done to establish the extent to which teachers can become more experts in their practice and develop the skills of monitoring and adapting their practices simultaneously and intuitively.

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