THE EFFECT OF PROFESSIONAL DEVELOPMENT ON SCIENCE TEACHERS' CLASSROOM PRACTICE

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ABSTRACT- This paper reports a case study about the classroom practice of science teachers after completing a teacher development programme. Little is known about the effect of professional development programs on the classroom practice of science teachers, therefore the results of the current study can give insight into the successes and shortcomings of professional development programs.

The aim of this research was to understand science teachers' classroom practice after completing an Advanced Certificate in Education (ACE) programme. The research question was twofold: Firstly, how do teachers view their classroom practice after completing an ACE programme? Secondly, to what extent have the outcomes of the programme been achieved? Clarke and Hollingsworth's model of professional growth was utilized as theoretical framework and served as a lens by which the research was understood.

The interpretive research paradigm, following a qualitative approach, was found to be the most suitable to achieve the aim of this study. Four science teachers, who completed the ACE Natural Science programme at a specific institution of higher learning, were purposefully sampled. Interviews, lesson observations and document analysis were used for data collection. Trustworthiness was enhanced by three data collection strategies, prolonged engagement, and member checking.

Content analysis was conducted to analyse data, using emerging as well as predetermined categories from literature. It was found that these teachers adopted, to some extent, most of the seven roles of educators as envisaged by the programme. It was found that teachers experienced professional growth differently in terms of professional identity. Three of the teachers believed that their classroom practices have improved, they were enthusiastic and engaged their learners in practical work, making use of improvised resources. The fourth teacher did not make use of practical work despite the fact that the school had a laboratory. From the results, a revised model of teacher professional growth was proposed, specifically for developing countries. It is recommended that some resources and follow-up professional support be provided with professional development programmes to enable teachers to implement and maintain improved practices.

Keywords: ACE, classroom practice, professional development, professional identity, science teacher

1. INTRODUCTION

The ultimate goal of teacher development programmes is the enhancement of learner outcomes (Desimone, 2009) through improved teaching practices (Supovitz & Turner, 2000). The emphasis on improving classroom practice is based on the strong relationship found between classroom practices of teachers and learner outcomes (Wenglinsky, 2002). Professional development of science teachers is a priority in South Africa (SA), in view of poor learner performance in international assessments, poor grade 12 results, the effects of curriculum changes since 1994, and the heritage of inadequate teacher training in the apartheid era.

Advanced Certificate in Education (ACE) programmes were offered by Higher Education Institutions in SA from 2003 (Steinberg, Barclay, Inglis, Magongwa, Mayisela, Nakedi & Snell, 2003). The purpose of

ACE as a professional teacher development programme was to upgrade and re-skill teachers (Department of Education (DoE), 2000). There was a rapid increase of ACE programmes on offer, though not in the subjects where it was needed most. The extent of this increase led to a review of the ACE programmes (DoE, 2007; Kruss, 2009). Consequently, it was replaced by a programme named the Advanced Certificate in Teaching (ACT) (Department of Higher Education and Training, 2011). Despite the discontinuation of the ACE, there is a need to understand how the programme affected the practices of individual science teachers, as such studies have not been reported. The current paper contributes to the research literature by reporting a case study aiming to gain in depth understanding of four science teachers' classroom practice after they completed an ACE Natural Science (NS) programme. The following research question guided the study: How can the classroom practices of science teachers be understood after they completed an ACE NS programme? Such understanding is vital to learn from the successes and challenges of the programme when designing future professional development for science teachers.

2. LITERATURE REVIEW

Teacher development programmes are offered in different delivery modes such as certificate programmes, workshops, seminars, action research, coaching and mentoring (Loucks-Horsely, Stiles, Mundry, Love and Hewson, 2010). It was also found from literature reviewed that some modes of teacher development like once-off workshops are ineffective and they do not enhance learner performance (Ono and Ferreira, 2010; Borko, 2004). However, it is acknowledged that workshops can serve a different purpose for example for the orientation of teachers on new policies (Desimone, 2009; Guskey, 2003; Garet, Porter, Desimone, Birman, & Yoon, 2001). Sandholtz and Scribner (2006) proposed some core features that should be taken into consideration when designing effective professional development programmes. These core features included: the focus of a teacher professional development being on what learners are struggling to learn; be based on the analysis of learner performance; based on teachers' needs; be school-based; be ongoing; focus on improving learner outcomes; coherent and collaborative.

In South Africa, Aluko (2009) explored the impact of an ACE programme in Educational Management on the professional practice of teachers and not ACE NS. In Aluko (2009) study the change in the teachers' professional practice was evaluated from the way teachers understood, interpreted and implemented the policies after completing the programme. In the US, another study investigated the effect of professional development on knowledge, self-efficacy and beliefs of mathematics teachers and administrators (Carney, Brendefur, Hughes & Sutton, 2014). It was found that the professional development programme influenced the administrators and teachers' mathematical knowledge, self-efficacy and beliefs. Clearly, more studies that explore the views of teachers on classroom practice after completing a teacher development are still needed.

Classroom practice is linked to professional identity as argued by Beijaard, Mweijer and Verloop (2004). Furthermore, Richardson (1996) argued that professional teacher development needs to change teachers' knowledge, beliefs and attitudes as these have direct effects on the teachers' classroom practice. Therefore, this suggests that classroom practice cannot be dissociated from the teachers' professional identity. Desimone (2009) argues that the teachers' beliefs and attitudes need to be changed first before their classroom practice is changed, while Guskey (2002) argued that learner outcomes change first then the teachers' beliefs and attitudes follows.

Clarke and Hollingsworth's model (2002) of professional growth was used as a theory to frame the study. This model depicts the influence of a professional development programme on classroom practice, professional identity and learner outcomes as a web of possible pathways of enactment and

reflection. These alternative pathways make the model more versatile than the linear one-way model of Guskey (2003) and Desimone's (2009) linear two-way model. Figure 1 shows the framework, comprising of 4 interconnected domains, namely the external domain, domain of practice, personal domain and domain of consequence. In our study, these domains are represented by the ACE NS programme, classroom practice, professional identity and learner outcomes respectively.

The model makes it possible to describe how growth in any of the three internal domains influence each of the other domains through the processes of direct enactment or reflection. Specifically, teachers' classroom practice may be enhanced in three ways: direct implementation of something learnt in the ACE programme (arrow 1), planning and trying something new based on enhanced professional identity (arrow 2) and improved learner outcomes (arrow 3). Similarly, the teacher's professional identity may be enhanced by three influences: reflection on the ACE program (arrow 4), learner outcomes (arrow 7) and classroom practice (arrow 8). Learner outcomes may be influenced by the teachers' professional identity (arrow 5) as well as classroom practice (arrow 6). Finally, enhanced professional identity may ultimately find expression in contributions to the external domain (arrow 9).

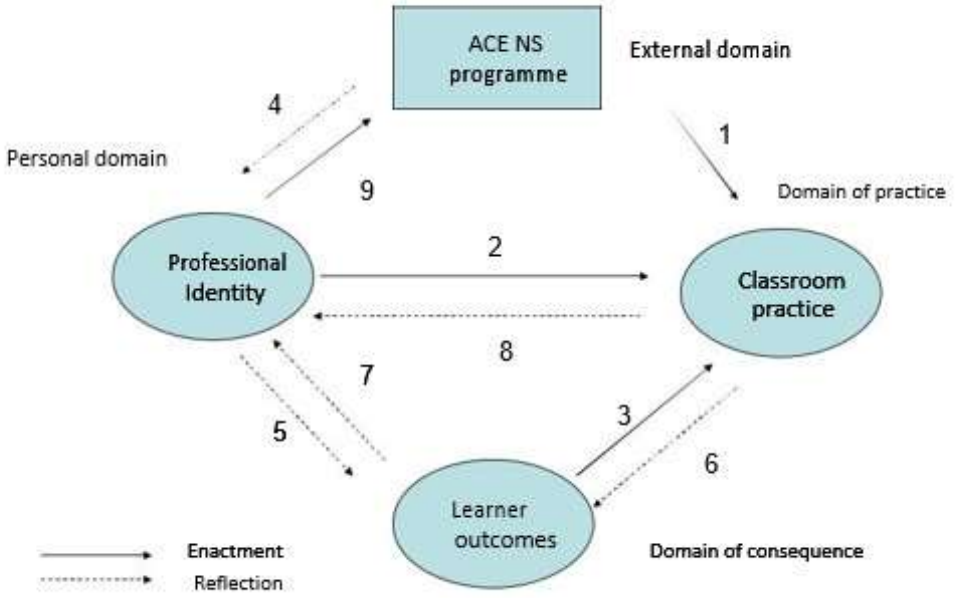

Figure 1: Theoretical framework based on Clarke and Hollingsworth's model of professional growth (2002:951)

3. METHODOLOGY

Searching for in depth understanding of teachers' classroom practices requires an interpretative paradigm to enable the researcher to understand the situations and actions of teachers as viewed and experienced by the participants. Therefore, a qualitative approach was chosen, employing a case study design in the teachers' natural environment (Creswell, 2007). The sample for the study was purposively selected, as is generally used for qualitative studies in order to ensure that participants meet predetermined criteria. (Creswell, 2007).

As indicated by Silverman (2014), for qualitative research, the researcher should have direct access to what is happening. In this study direct access to the classroom practice was realized by visiting teachers in their schools. Firstly, a semi-structured interview was conducted with each teacher. The interviews were audio recorded to ensure that no information is lost. Secondly, for each teacher, six consecutive lessons were observed during a two-week period in the third term. The teachers were asked to continue their normal routine during the observed lessons, following the curriculum as prescribed by policy, to ensure a natural classroom situation, rather than special lessons. A lesson observation schedule was developed specifically for the study, based on important aspects of classroom practice described in the literature. In particular, practical, pedagogical and language skills, subject knowledge, beliefs and attitudes were noted as the lessons progressed. Finally, the teachers' documents as well as learners' workbooks were analysed. Each teacher was asked to select three workbooks after completing the lesson observations.

Qualitative content analysis was conducted and each case was analysed separately. The transcriptions were initially read and coded by the first author, but repeated by the second author and discussed to reach consensus where interpretations differed, thereby enhancing trustworthiness. The majority of the categories emerged from the literature and theoretical framework, and some emerged from the data. Finally, the categories were grouped under the themes subject knowledge, laboratory work, pedagogical knowledge, learner outcomes, and professional identity.

The second data set was based on lesson observations. The observation schedule focused on the following aspects: teachers' subject knowledge, practical competence with experiments, pedagogical skills, language skills, beliefs and attitudes. The data from lesson observations were analysed in terms of these aspects. The third dataset was collected by analysing teachers' documents and learners' workbooks.

The design of the study enhanced trustworthiness. To enhance credibility of data collected through lesson observations, six lessons were observed for each teacher. Also, three data collection methods were used, allowing triangulation and enhancing dependability. Ethical research practices were followed to ensure that participants were not harmed physically or emotionally. Ethical clearance was obtained from the University and the Department Education gave permission to collect data in the schools.

4. RESULTS

The teachers in this study believed that their classroom practice had changed for the better after completing the ACE programme. They all indicated that they had mastered new subject knowledge, practical skills, and pedagogical skills from the ACE programme, and that learner outcomes have improved. Three of the teachers were enthusiastic and confident and engaged their learners in practical activities during the lesson observations. These teachers used improvised materials as their schools had no laboratory facilities. The fourth teacher, who was the only one with the laboratory in the school did not conduct practical work and demonstrations with learners. In addition, she did not display confidence in teaching science.

The results indicate that classroom practices of three of the teachers were enhanced by their improved knowledge and skills, their enjoyment of the programme, confidence and positive attitudes, as well as improved learner outcomes. It also transpired that the resource needs inhibited the improvement of classroom practice in these cases. The views and actual practices of the teachers indicated that the change in classroom practice was mainly brought through the changes to professional identity, and learner outcomes. There was little indication, however, of the direct

implementation of what was learnt in the programme, except for one example where one of the teachers used a lesson plan template provided during the programme.

In terms of the theoretical framework, improved classroom practice and improved professional identity both lead to improved learner outcomes. The learners' outcomes were expected to be enhanced as measured in terms of attitudes, behaviour and performance. Although learner outcomes were not directly investigated this study, teachers claimed that there was improvement in learner outcomes, specifically the learners' attitudes.

5. CONCLUSION

The conclusions led to a revised model of professional growth that represents professional development of teachers in poorly resourced schools. This model is shown in Figure 1. According to this model, science classroom practice and learner outcomes are observable outcomes of a professional teacher development program. These outcomes are a product of enhanced professional identity, rather than from direct implementation. In addition, there is a positive feedback effect from improved learner outcomes reinforcing classroom practice and professional identity as argued by Richardson (1994).

Figure 2: A suggested model of teacher development

6.DISCUSSION

Though the results of a case study should not be generalized, it is concluded that three of the four participants were restricted by the lack of resources in their schools to implement some of the knowledge and skills learnt. The challenge they experienced is similar to what Buczynski and Hansen (2010) established in their study that teachers struggled to implement knowledge and skills learnt in a professional development programme. However, the ways in which teacher professional development occurred depends on the unique personalities and circumstances of the teachers. This is in agreement with what Borko (2004) found in her study. She concluded that teachers responded to a professional development differently, saying 'some teachers change more than others through participation in professional development programme'.

The ACE programme did not fully develop the commitment of teachers to conduct practical work consistently. This was found when the analysis of documents revealed that most practical activities were conducted during data collection period, in fact, very little practical word was conducted during the semester prior to data collection. This may be an illustration of the Hawthorne effect as explained by Wickström and Bendix (2000). Therefore, it is possible that the enhanced classroom practice of the three teachers who conducted practical work during the observation period may gradually regress after the research was completed as found by Leonard and Masatu (2006). On the other hand, the experience of successful improvising may have good long term results. It is argued that teachers in the

current study could have realized their potential of conducting practical work when they were observed and they may be inspired to continue the practice. It is recommended that in future programs, support, including resources, should be provided to teachers after completing a teacher development programme to re-enforce and implement new knowledge and skills.

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