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Reflections of Practice Teaching Experience of Postgraduate Certificate in Education (PGCE) Students in Physical Science

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ABSTRACT Teacher students have mixed feelings when they have to enter the classroom for the first time to do their teaching practice. They have to showcase ~~their teaching methodologies~~ what they have learnt about in the content knowledge. This paper reports on the experiences of 38 Postgraduate Certificate in Education (PGCE) students at Central University of Technology, Free State (CUT) from 2011 to 2014. ~~This~~ The study investigated how much can first-time student teachers can they adapt to teaching and its methodologies. The data was obtained ~~through~~ reporting by students on their return from teaching practice based on a set of open-ended questions. They had to share their experience with fellow students in the methodology class. Their responses and advices to one another showed significant baseline for teaching practices especially for the first time and what makes a good science teacher. The statistical analysis of their responses indicated that that there are serious gaps between normal teaching and thinking what teaching is about. Based on these, the paper came up with possible intervention strategies to overcome these problems and enhance teaching practice for first-time student teachers.

INTRODUCTION

Post Graduate Certificate in Education (PGCE) is one of the qualification programs offered at CUT to students without teaching methodologies or more specifically teaching qualification or profession. Students have a variety of subject choices in terms of methodology of teaching and Physical Science is one of them. The researcher is currently responsible for Physical Science Subject Methodology subject. Students in this subject are chosen based on their prior qualification, whether degree or diploma, in Sciences or Engineering. All these students enroll for this subject and qualification in order to acquire a teaching qualification to be able to teach Physical Sciences in High Schools and/or Further Education and Training (FET) now called Technical and Vocational Education and Training (TVET) Colleges.

Literature Review

The country, South Africa, has been faced with lack of underqualified teachers more especially in the teaching of Physical Science as a subject. It seems the problem with teaching and learning of physical science as a subject in schools is not only with the content but the methodology of teaching it. West Cape News (2016) reported DA to have mentioned that South Africa has more than 1700 unqualified secondary schools teachers. In 2008, Free State Province was reported to have "the highest number of under-qualified teachers, with 39 percent of all science teachers lacking the necessary credentials, while the Western Cape performed best, with 8.28 percent of science teachers under-qualified", said DA Shadow Minister for Higher Education and Training Dr Wilmot James (West Cape News 2010).

There has been a decline in the number of learners enrolling for 2010 NSC Mathematics and Physical Science (DoE NSC 2010) hence the establishment of Dinaledi schools in all provinces within the country to try to alleviate that. The performance by learners in Mathematics and Physical Science in schools are in a bad state. Mudau (2014) and Makgato and Mji (2006) reported that one of the factors contributing to this poor state is "the direct influence related to teaching strategies, content knowledge, motivation, laboratory use".

Ramohapi et al. (2015) and Makgato and Mji (2006) reported that there is a low number of learners who take Mathematics and Physical Science at school but even still quite a large number of them are not doing well in these subjects.

South African Broadcasting Commission (SABC) (2013) had reported that there are still

quite a large number of shortages of skilled teachers in Mathematics and Science within the country. As a result some high schools (84) did not offer Mathematics, something that impact on the learning of Physical Science. Morales (2014) and Redish (2005) argued that Mathematics is the language of Physics (science) and physicists blend conceptual physics (science) with mathematical skills and use them to solve and interpret equations (Redish 2009). Hence, without the knowledge of Mathematics, learners are unable to do well in Science (Physics) to enroll in science related studies and/or pursue career in Science.

For economic sustainability, the country needs skilled jobs and Mathematics and Science are essential tools for that. This is only attainable with and through the production of good teachers in these subjects (Africa STI 2011). Phage (2015) investigated and reported that a large number of first year students still expect to be taught what they have learnt at high school in order to apply or use it in the new concepts they learn at university. As a result a good science teacher will be able to impart a long lasting knowledge and skill that will not require learners to expect to be taught what they already know or learnt but to build up what they know or learnt.

Africa STI (2011) further reported that according to the paper released on September 21 by the South Africa's Centre for Development and Enterprise (CDE) "The poor performance of many teachers is a major reason for the dismal results achieved by large sections of the schooling system". Parker (2012) quoted Prof Osman saying "the key concern is the high failure rate in Maths and Science and the high rate of students who are just not making it to matric".

With proper and enthusiastic training of motivated Mathematics and Science teachers by tertiary institutions (Universities and Teacher Training Colleges) and the support of the government, the community and different stake holders in the form of businesses, industries and non-governmental organizations (NGO's), this problem will be greatly reduced.

As a step forward in this initiative, there was an establishment of partnership between different stakeholder (Investec and Independent Schools Association of Southern Africa (ISASA)) and the Department of Basic Education (DBE) to foster and broaden teacher recruitment (The Skills Portal 2013) to deal with teacher development and education. At the same time this would make impact if institutions of higher learning were involved as a training institution. The responsibility of higher institutions of learning would ensure the proper training in the form of qualification in those specialized skills.

Objectives of the Study

The researcher in this paper therefore probes the following:

- Ø What impact does practice teaching have on first-time student teachers in Physical Science, that is, how CUT's PGCE students in science methodology value their practice teaching?
- Ø To what extent do these student teachers demonstrate their knowledge of science content through teaching methodologies?

The aim of the paper by the researcher was therefore to investigate how PGCE students in Physical Science at CUT are adapting to teaching and learning during teaching practice period.

The following objectives of the paper was put into perspective in terms of progress made by CUT with regard to developing and producing qualified Physical Science teachers in terms of the science methodologies

- · To determine the impact of practice teaching on the PGCE student teachers in teaching science.
- · To determine to what extent do the student teachers demonstrate their knowledge of science content through teaching methodologies.
- · Get the impression and or experiences of PGCE student teachers during practice teaching and how they can be helped.
- · Examine the role of the practice teaching to PGCE student teachers?
- · Develop recommendations on the implementation of possible teaching strategies for future science teachers.

PGCE in Science at CUT

PGCE in Science (Physics and Chemistry) at CUT is a one year qualification aimed at people who already had a qualification (either diploma or degree) in Science or Engineering but does not have a teaching profession.

For a student to be admitted into the program, he or she must have least two relevant subjects (Chemistry, Physics, Mathematics and Biology/Life Sciences) in their already completed non-teaching qualification. The student must do subject methodologies of these two subjects in their PGCE. Chemistry and Physics are combined as Physical Science PGCE subject methodology. According to high schools and FET Colleges curriculum (NCS and CAPS), Physics and Chemistry are combined as one subject, Physical Science.

This specific subject methodology is aimed at people (students) who will be or are interested in teaching Physical Science at high schools or Further Education and Training (FET) colleges in future. The purpose of this course is to train prospective high school Physical Science teachers not only for the qualification but the skills and capacity to teach this subject without hindrance. Based on the topics of the subject, they will enjoy flexibility in terms of how best to introduce and teach the subject.

PGCE in Science qualification prepare students to teach science across the National Curriculum Statement (NCS) and Curriculum Assessment Policy Statement (CAPS) (DoE 2012). The aim is to equip students to become confident, autonomous teachers, enthusiastic about science and learning (Bristol University 2016).

As prospective physical science teachers in schools, they will be able to apply their science teaching skills to obtain the specific subject learning outcomes (LO's) as stipulated in NCS and or CAPS documents of National Department of Basic Education.

PGCE in science is also reported to be a collaborative learning and teaching effort that promote innovative, high-quality professional development and support among science educators ("Teaching and Learning Collaborative"). It provides teachers with deeper knowledge of science teaching content as well as the effective science teaching and learning instructional strategies and methodologies to use in the classroom.

Science Teaching Methodologies

The common teaching methodologies in science have been identified as follows (Teacher 2012):

- Ø Lecture Method – teacher centred approach
- Ø Project Method – problem solving and activity based approach
- Ø Heuristic Method – the find out by learner approach
- Ø Analytic /Synthetic Method – the breaking down of what is to prove method
- Ø Problem-solving Method – the use of acquired knowledge to solve a problem approach
- Ø Scientific Method – the ask and answer through observations in an experiment

Science Teaching Methodologies vs Learning Strategies

Paper has been conducted to prove that teaching and learning are inseparable and hence they need to be reported simultaneously. Moore (2011) defined the basic learning styles as different ways in which learners will learn best and how teachers adapt to the different teaching methods in order to yield better results. He further stated that individual learning is dependent on "a combination of learning through seeing, doing, telling and listening".

Angell et al. (2005) said that beginner teachers are typically expected to display some understanding of science content with less knowledge of teaching strategies and that knowledge is required to teach the very same content. They further stated that an expert science teacher will be having an integrated knowledge base which connects specific aspects of science knowledge and teaching methodologies required to teach that knowledge and expose the related students' reasoning.

Nilsson and Loughran (2012) investigated that pedagogical content knowledge (PCK) can be used as academic construct and conceptual tool for planning and assessment in developing professional knowledge and practice of student teachers during their training as science teachers. Angell et al. (2005) concluded that a pedagogic reasoning about science content in a school teaching context is a conceptual understanding that makes a beginner teacher different from an expert teacher. They came up with the following model framework to explain the transition. They listed a framework that simply indicates the connections, qualities and factors that influence the ability of an individual to teach

to his or her best capability and flexibility, which classifies one as an expert or best teacher. Nilsson and Loughran (2012) concluded that to empower student teachers during training as professional, it is better to understand and develop teacher preparedness and the nature of PCK among student teachers in the teacher training program.

Rollnick et al. (2013) reported that the subject matter knowledge (SMK) according to in-service teachers in terms of its learning and how to teach it is a single unit. They did investigation to understand the way student teachers learn to teach SMK unlike experienced who view SMK differently. They therefore concluded that due to this, learning SMK to teach is varies with training program for student teachers to be prospective teachers.

Aim

The aim of the paper was to explore the perception and impression of PGCE students on their first-time teaching practice experience. The students had to share and reflect on the practice teaching experiences, based on a set of open-ended questions, as student teachers.

METHODOLOGY

In this paper, qualitative method was used. Content analysis of students' reports and response to a questionnaire made of open-ended questions about their practice teaching experience were done. Open-ended questions were used for its advantage of giving immediate feedback to answers and a follow-up revision of those answers (Attali and Powers 2010). The advantage also is the significantly high reliability scores if there is no feedback and significantly lower anxiety after feedback. Open-ended questions provide immediate or spontaneous feedback and they are not biased in suggesting what the correct answers have to be (Reja et al. 2003). The researcher used open-ended questions for this purpose in order to analyze data and concluded based on the obtained results.

The paper was conducted out of a group of 38 PGCE students in Physical Science methodology in the past three years, 2011 to 2013 at CUT. Students were placed for six weeks (2 weeks in 1st semester and 4 weeks in 2nd semester) to do their practice teaching in different schools within the Mangaung Municipality Region (Free State Province).

On their return from teaching practice in the second semester, a questionnaire, consisting of open-ended questions as a guideline, was handed out to students. Thereafter they had to report to fellow students on their individual experiences, to determine the extent of the similarities and differences they encountered in their first-time teaching practice. All schools and environments have difference in their own predicament and students have to learn from one another. Of the 38 students, only 7 did teaching practice either in their home town or their former high schools.

The purpose of placing them close by the university was so that lecturers could go and evaluate including being evaluated by their mentor (subject) teacher within the school. Though students are evaluated within the classroom by their lecturer (CUT) and mentor teacher (school), the students are expected to take the role of a teacher inside and outside the classroom within the school. The evaluation by the mentor covers the inside and outside the classroom and the conduct of the student teacher.

On completion of their practice teaching, they came up with the following highlights of their teaching experience in their practice teaching reports.

RESULTS

The Highlights of Physical Science PGCE Student Teachers' Practice Teaching Experience

Though nervous at first, students felt welcomed by the principal, staff and learners as a whole. They were welcome and introduced in the staff meeting and also introduced to learners in the students assembly on the first day. They then accompanied the mentor (subject teacher/head) to their respective subject classes and the subject learners also welcomed them.

The first week they observed the mentor doing teaching. They took over the second week while the mentor teacher was observing to acclimatize the learners to them and to ensure discipline and that the student teacher has control and authority over the learners in class. From the third week the mentor teacher stopped accompanying them to class.

At first they were nervous when the mentor teacher leaves them to go class on their own but they managed to control and manage the class and learnt to deal with disruptive and troublesome students. They learnt to draw the attention of the learners in class, identify and deal with the extroverts and introverts in class and to get almost full participation of the learners within a class.

Most of the student teachers enjoyed the support of the mentor teachers and other staff members and principal who encouraged them to well and complimented them on their studies and the progress they made with the learners. They also learnt to earn the respect of the learners and other staff members within the school and felt a sense of belonging and being part of the team.

They implored the best possible teaching methods to facilitate learning and teaching and to drive the interest of the learner in the subject. They discovered that learners enjoyed being taught with experiments and they were all enjoying the lesson and participating in experiments. Student teachers discovered that Physical Science should be interactive in the form of group work and visual aids (teaching media). To inspire learners, teachers should research a lot about a topic before they teach it as learners will ask outside the scope of their learning.

Challenges

- The feeling of immediate transition from being a student to being a student teacher was at first difficult
- Coping with workload and responsibilities of being a teacher was a scary
- Having to enforce discipline (late coming, disruptive, incomplete/undone homework, troublesome and bully) on the learner was difficult
- Some encountered poor reception and display of unwelcoming atmosphere and kind of negativity from some staff members
- Some display of indiscipline among learners due to a kind of indiscipline or lack of motivation from teachers
- Overcrowded classes, which made control of learners, evaluation of lesson and assessment of subject difficult

Findings

The paper can lead to an increased realization by CUT that there is a greater need for a strong partnership between the institution (CUT lecturers), the school (subject teachers, fellow staff members and principal) and the government (National and Provincial Departments of Education) in the development and improvement of quality science teaching and learning. The inputs and experiences of student teachers can be used to improve the high quality of teaching and learning and help to produce highly motivated and competent science teachers. School will have confident science teachers who will motivate learners to do well in their subjects. This will emanate in more learner enrolment in mathematics and science and hence will improve and increase the learner performance in these subjects.

DISCUSSION

Student teachers agreed that teacher enthusiasm helps to create a conducive learning environment. Students' understanding of science teaching methodologies was challenged through teaching practice and that had a lot of impact on the science concept learning. It is therefore teacher enthusiasm that has an effect on the learner to develop an interest or not in the subject matter and this was confirmed by the student teachers from the teaching practice experience.

Student teachers were able to apply their knowledge of lesson plan and preparation in practice. They all agreed that teaching practice helped them to focus on the subject matter, to teach and finish as well as evaluate their lessons within a specified time period of a class. They observed that in order to get full attention and participation of their learners, they had to divide their class into groups and give them an activity. With proper control, monitoring and facilitation of the student teacher, learners developed a constructed science content knowledge that inspired them to learn science. Another strategy they observed to get full learner attention and participation was through demonstration and experimental activity where learners learned through observation and were able to come up with their own conclusions, with the teacher being able to direct them the subject matter content.

CONCLUSION

Students enrolled for PGCE with different academic background/qualification but seek to reinforce it with an education profession in the classroom. Even those who are from government sectors, find it difficult to stand in front of learners to educate them. It first starts with preparation of the lesson in terms of the lesson plan. Several factors that comprise the lesson plan have to be taken into consideration. In doing so, they had to consider the learner's prior learning in the introduction of the lesson. This, they confirmed, will always determine how successful your lesson will be. It will also help in getting the learners interested for the duration of the lesson. These are the things that student teachers have to bear in mind. The paper explored and shared the reflections in the experiences of PGCE student teachers in Physical Science Subject Methodology who had stood in front of the class and taught for the first time. Students when they came back from their teaching practice were given an opportunity to reflect on their experiences. They did this by discussing during lecture period in the form of reporting what they have experienced, liked or did not like about their Physical Science teaching practice. Fellow students then made follow up questions, inputs and recommendations and referred to what they have learnt about different methodologies of teaching.

RECOMMENDATIONS

Based on the results of the analysis of student teachers' response and reports, the institution, methodology lecturers in particular, need to do an intervention based on these reports. The intervention should be based on what they thought teaching is and what it is about in terms of science teaching methodologies. Student teachers should be encouraged and empowered to use different science teaching methodologies. Only through evaluation of these methodologies will student be competent to teach effectively without fear. Student teachers should have the confidence to practice their teaching with confidence and second evaluation of their teaching practice should also be done in this regard.

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