

**NATURAL SCIENCES PRE-SERVICE TEACHERS' EXPERIENCES AND
PERCEPTIONS OF THE PRACTICAL LEARNING COMPONENT OF THEIR
BED CURRICULUM**

by

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DECLARATION


Declaration: O.E. du Plessis (98053977)

Submission of MEd (2 publishable articles)

I, **Odette Elizabeth du Plessis**, declare that the Master's Degree (article option) that I herewith submit for the Magister Educationis at the University of the Free State is my independent work, and that I have not previously submitted it for a qualification at another higher education institution.

I, **Odette Elizabeth du Plessis**, hereby declare that I am aware that the copyright is vested in the University of the Free State.

I, **Odette Elizabeth du Plessis**, hereby declare that all royalties as regards intellectual property that was developed during and/or in connection with the study at the University of the Free State, will accrue to the University.

Signed: 

Date: 30 November 2021

DEDICATION

I dedicate my research study to:

- my husband, Janco du Plessis, whose love and support carried me through many difficult times; and
- my two sons, Janno and E-Jay, for their love and patience.

I would not have been able to complete my research without their invigorating energy and inspiration.

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LIST OF ACRONYMS

CAPS: Curriculum and Assessment Policy Statement

DBE: Department of Basic Education

HET: Higher Education and Training

ITE: Initial Teacher Education

MRTEQ: Policy on the minimum requirements for Teacher Education Qualifications

NS: Natural Sciences

PCK: Pedagogical Content Knowledge

SCT: Social cognitive theory

SLT: Social learning theory

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CHAPTER 1

ORIENTATION OF THE STUDY

Learner achievement around the world has been influenced by one crucial factor, namely teacher effectiveness (Darling-Hammond, 2017: 291). The need for teacher effectiveness in science is supported by the call of Mtsi, Maphosa and Moyo (2016: 114) for properly trained science teachers that can cultivate scientific knowledge. The importance of scientific knowledge is highlighted when Mtsi et al. (2016: 109) suggest that the economic development of a country depends on the scientific knowledge cultivated during the teaching and learning of science in schools.

In 1986, Shulman introduced the concept pedagogical content knowledge (PCK) as a unique type of knowledge used specifically by teachers to teach. In response to the identification of this new type of teacher knowledge, extensive research was done by various researchers to determine the knowledge bases of teachers and the combination thereof into the PCK needed to develop teacher effectiveness (Park & Suh, 2018: 550). As a result, researchers such as Sutawidjaja and Irawati (2017: 11) (Sutawidjaja & Irawati, 2017) concluded that PCK is the integration of content knowledge (subject teaching material) and pedagogical knowledge (knowing how to teach), blended into a specific type of knowledge needed to teach learners effectively.

Schneider and Plasman (2011: 534) unpack PCK as knowledge of science, knowledge of the learner, knowledge of the context, and knowledge of general pedagogy. Schneider et al. (2011: 534) further emphasise that science teachers should use PCK to effectively teach science and to support learners in the learning of science. A competent teacher is not only knowledgeable, but also has the following attributes: professional skills, a positive attitude, and an interest in education (Amankwah, Oti-Agyen & Sam, 2017: 14). Teachers use these attributes, combined with subject matter knowledge, pedagogical content knowledge, and curricular knowledge (Cochran, 1997; Shulman, 1986: 9), to teach Natural Sciences (NS) effectively.

Bearing in mind that the development of PCK requires learning to teach in meaningful contexts (Magnusson, Krajcik, & Borko, 1999: 124), it therefore stands to reason that NS pre-service teachers should be exposed to meaningful teaching opportunities. These teaching

opportunities should include support and feedback from experienced and knowledgeable people that aid pre-service teachers to critically reflect on their own teaching in the development of PCK (Magnusson, Krajcik, & Borko, 1999: 124). All around the world practical learning is included in Initial Teacher education (ITE) programmes to provide pre-service teachers with opportunities to practice their teaching.

Researchers (Darling-Hammond, 2006; Juuti, Christophersen, Elstad, Solhaug, & Turmo, 2018; Rauduvaite, Lasauskiene & Barkauskaite, 2015) have emphasised that practical learning is a fundamental component of training pre-service teachers in Initial Teacher Education (ITE) programmes. Barnhart and van Es (2015: 83) frame practical learning as a methodical approach that engages pre-service teachers in the observation, analysis and reflection of their own teaching and that of others. The practical learning of pre-service teachers takes place from and in practice (DHET, 2015: 10). Learning from practice can take the form of analysing the practice of teachers, as illustrated in case studies, videos, and observed lessons (Moosa, 2018: 60).

Learning in practice involves learning to teach in classroom environments that are simulated and authentic (DHET, 2015: 10). Landon-Hays, Peterson-Ahmad and Frazier (2020: 3) refer to a simulated classroom environment as a space that allows for the combined learning of content knowledge and teaching pedagogy. Microteaching is used as a strategy to create a safe environment for pre-service teachers to prepare for the actual teaching practice experience (Davids, 2016:2). The type of environment that is created in microteaching aligns to the simulated environment needed for pre-service teachers to learn in practice. Dlamini (2018: 87) explains that Work-Integrated Learning (WIL) for pre-service teachers involves placement in authentic environments, namely schools, for specified periods of time to practise teaching.

PROBLEM STATEMENT

South African teacher education programmes have been criticised for overemphasising theory above practice (Duku, Mdaka, & Sethusha, 2016: 205), highlighting the need for a quality ITE curriculum that finds a theory-practice balance (Basturk, 2016: 35). The Revised Policy on The Minimum Requirements for Teacher Education Qualifications (MRTEQ) (DHET, 2015:10) provides directives for balancing theory and practice by stipulating that the

acquisition, integration, and application of the different types of knowledge for teaching are associated with different forms of learning, such as disciplinary, pedagogical, situational, fundamental, and practical learning.

Practical learning is especially important in developing an essential type of knowledge for teaching, namely tacit knowledge (DHET, 2015: 10). Fraser, Beswick and Crowley (2019: 3) state that novice teachers become experts over time and through experience develop a type of PCK that is personal and hard to formalise. Fraser et al. (2019: 3) further explain that the tacit PCK of expert teachers can be observed in their teaching and taught implicitly. However, to ensure that pre-service teachers learn tacit PCK, the knowledge must be captured and taught explicitly. Lombard and Themane (2015: 18) state that the situated learning of pre-service teachers is embedded within the school context, which is inherently social in nature. Teacher knowledge is “situated in practice”, and the application of theory to practice should, therefore, be taught as a situated learning experience that is rooted in context. Robinson and Rusznyak (2020: 526) agree that learning to teach is more than a cognitive exercise and emphasizes that effective training of pre-service teachers is positively influenced by situational learning.

Van Wyk and De Beer (2019: 276) state that the theory-practice divide is perpetuated by a lack of integration during the practical learning of pre-service teachers. The theory of good teaching practices often takes a back seat when pre-service teachers are confronted with challenging situations (Lortie, 1975 in Van Wyk & De Beer, 2019: 276). Moreeng (2015: 94) states that, in the pursuit of integrating theory into practice, pre-service teachers need to be prepared for the world of teaching. Microteaching is a component of practical learning that gives pre-service teachers the opportunity to be exposed to and practice actual teaching Moreeng (2015: 94). The integration of theory in practice, in preparation for the world of teaching, includes the need for pre-service teachers to experience teaching as a professional (Yeigh & Lynch, 2017: 112), and to reflect on their professional performance (Gelfuso, Parker, & Dennis, 2015: 12).

Several studies have been conducted to investigate the experience of pre-service teachers during practical learning (Ellis, 2010; Kiggundu & Nayimuli, 2009; Marais & Meier, 2004; Rauduvait et al., 2015). Research shows that in various countries practical learning is

associated with the positive and negative experiences of pre-service teachers (Baskan, Yildiz, & Tok, 2013: 1075; Güven, 2010).

It is for this reason that Rauduvaite et al. (2015: 1053) emphasize that the practical training of pre-service teachers should be improved by continuously researching their experiences. Researching the perceptions and experiences of the practical learning component of NS pre-service teachers could provide valuable insight into the experiences needed to strengthen the integration between theory and practice within current teacher education curriculums. This information could then be used to determine the components of practical learning that are needed to make the Natural Sciences B.Ed. curriculum's practical learning component more effective.

AIM

The overarching aim of the study was to determine the experiences and perceptions that Natural Sciences pre-service teachers have about the practical learning component of their Bachelor of Education (B.Ed.) curriculum. The purpose was to explore how Natural Sciences pre-service teachers perceived their practical learning experiences, in particular during microteaching and WIL, thereby gaining insight into the components of practical learning needed to enhance the efficacy of microteaching and WIL for Natural Sciences pre-service teachers.

RESEARCH QUESTIONS

The following research questions guided the study:

Primary research question:

What experiences and perceptions do natural science pre-service teachers have about the practical learning component of their BEd curriculum?

Secondary research questions:

- I. What type of practical learning is needed to make Natural Sciences pre-service teachers more effective?
- II. What are the perceptions that Natural Sciences pre-service teachers, have of microteaching and WIL as part of their B.Ed. curriculum practical learning component?

- III. What are the experiences that Natural Sciences pre-service teachers, have during microteaching and WIL as components of their B.Ed. curriculum practical learning?
- IV. What components are needed to make the Natural Sciences pre-service teachers' B.Ed. curriculum practical learning component more effective?

OBJECTIVES

The following research objectives guided the study:

- I. To identify the type of practical learning that is needed to make Natural Sciences pre-service teachers more effective.
- II. To explore the perceptions that Natural Sciences pre-service teachers, have of microteaching and WIL as part of their B.Ed. curriculum practical learning component.
- III. To explore the experiences Natural Sciences pre-service teachers, have during microteaching and WIL as components of their B.Ed. curriculum practical learning.
- IV. To justify the components that are needed to make the Natural Sciences pre-service teachers' B.Ed. curriculum practical learning more effective.

THEORETICAL FRAMEWORK

In this study Albert Bandura's social learning theory (1977) and the later evolved version, i.e. social cognitive learning theory (1986), are used as the theoretical framework. Bandura's social learning theory (1977) postulates that people learn when they observe, imitate, and model the behaviours of others (Edinyang, 2016: 41; Shaffer, 2009: 46). Bandura's social cognitive learning theory (1986) adds that people are not ruled by their circumstances but are governed by the reciprocal interactions between personal factors, environmental factors and behaviour that occur in social constructs (Bandura, 2006: 165). The theoretical framework for this study is used to explain how practical learning, as defined by MRTEQ (DHET, 2015: 10), occurs as learning from practice and in practice.

Bandura's observational models, namely live, verbal instructional and symbolic models (Nabavi, 2011: 9) are used when NS pre-service teachers observe effective teaching from practice. Symbolic models refer to real or fictional characters that can be aligned to the teachers depicted in scenarios, videos and case studies. Verbal instructional models involve

descriptions and explanations of behaviour (Nabavi, 2011: 9) that can refer to NS pre-service teachers observing examples of practice with structured scaffolding of theory (Reeves & Robinson, 2014: 236). A live model refers to an actual individual demonstrating behaviour (Nabavi, 2011: 9) that can, in the case of ITE, be either the lecturers that model teaching (Reeves & Robinson, 2014: 244), or mentor teachers that model teaching strategies and classroom practices (Simsar & Doğan, 2020: 96). Pre-service teachers that lack theoretical underpinnings can only imitate procedural behaviour (Reeves & Robinson, 2014: 243).

According to Bandura's social learning theory four conditions are needed for the modelling process, namely attention, retention, reciprocation, and motivation (Edinyang, 2016: 42; Nabavi, 2012: 8; O' Rorke, 2006: 72). Bandura is of the opinion that attention is influenced by reinforcement (Crain, 2016: 208). Bandura also noted that "we often attend to powerful, competent, prestigious models because we have found that imitating them, rather than inferior models, leads to more positive consequences" (Crain, 2016: 208; O' Rorke, 2006: 72). Lecturers and mentor teachers are both models that need to capture the attention of pre-service teachers and provide opportunities for retention and reciprocation while being motivational. Simsar and Doğan (2020: 95) highlight that mentor teachers should be role models with the attributes of being encouraging, observant and supportive to improve the classroom practices of pre-service teachers.

Bandura (1986) added to his social learning theory the idea that people contribute to their own behaviour through self-organisation, pro-activeness, self-regulation, and self reflection (Bandura, 2006: 164). The addition resulted in Bandura's social cognitive theory, which adopts an agency perspective towards learning (Bandura, 2006: 164). Agency refers to learning behaviour by intentionally influencing one's own behaviour. A parallel comparison can be drawn to NS pre-service teachers that intentionally make choices regarding teaching to achieve objectives in varying contexts (Jita, 2016: 11). NS pre-service teachers reflect on their choices and adjust when needed. When NS pre-service teachers "learn to teach" their learning is not confined to observing and imitating models, but rather transcends to modelling that includes the reciprocal interplay of intrapersonal, behavioural and environmental factors.

RESEARCH DESIGN AND RESEARCH METHODOLOGY

This study will employ a qualitative research design to develop an in-depth understanding (Vass, Rigby & Payne, 2017: 299) of the experiences and perceptions that NS pre-service teachers have about the practical learning component of their B.Ed. curriculum. Nieuwenhuis (2008: 50) describes qualitative research as research that collects descriptive data on phenomena, or in a particular context, with the purpose of increasing the understanding of what is studied. The purpose of exploratory research is to actively and purposefully seek “discoveries” (Hussein, Hirst, Salyers, & Osuji, 2014: 4) to better understand a phenomenon (Babbie, 2011: 95), making this type of research useful for this study, as the study focuses on the practical learning of NS pre-service teachers in the context of a new university in South Africa. It is important to note that researching a phenomenon in a new context may yield unexpected data (Babbie, 2011: 20).

In this study non-probability sampling, also referred to by Cohen, Manion, and Morrison (2007: 110) as purposive sampling, was used to select a target group (Etikan, Musa & Alkassin, 2015: 2), namely, the fourth year NS pre-service teachers from the School of Education positioned in a new South African University. The fourth year NS pre-service teachers were approached via e-mail to participate in the study.

The target group of this study were specifically approached, based on their knowledge, to ultimately address the purpose of the study (Babbie, 2011: 207; Cohen et al., 2007: 113; Maree & Pietersen, 2008: 177), namely to obtain insight (Onwuegbuzie & Collins, 2007: 287) into the experiences and perceptions that NS pre-service teachers have about the practical learning component of their B.Ed. curriculum.

In this study convenience sampling was used to obtain “available” (Lune & Berg, 2017: 38) participants from the target group that were at the end of their B.Ed. curriculum. Lune and Berg (2017: 39) caution that participants of convenient sampling must be carefully evaluated for their appropriateness to the study. Fortunately, convenience sampling naturally resulted in a diverse group of participants that were appropriate for the study.

In this study data were collected from the fourth year NS pre-service teachers by means of one focus group discussion of four participants, and four individual interviews. In this study a focus group discussion was useful to obtain data by using semi-structured interviews in order

to question several participants simultaneously (Babbie, 2011: 343; Memduhoglu, Kotluk and Yayla, 2017: 275). The flexibility of semi-structured interviews allows the researcher to go beyond the predetermined questions by pursuing areas initiated by interviewees, resulting in more “textured” accounts (Lune & Berg, 2017: 70). The value of semi-structured interviews for this study, therefore, lies in premise that this type of interview is both structured and flexible (Cohen et al., 2007: 128). Jamshed (2014: 87) defines semi-structured interviews as in-depth interviews that include open-ended questions that have been predetermined by the researcher. Corbin and Strauss (2014: 93) state that researchers must ensure open ended questions consistently focus on the specific aspect that is researched.

Individual interviews were conducted with participants that were willing to participate in the study, but were not able to attend the focus group discussion due to logistics. The original open-ended questions used in focus group discussion were streamlined to focus more pertinently on aspects of microteaching and WIL as part of the NS pre-service teachers practical learning. Lambert and Loiselle (2007: 229) state that a detailed account of participant’s thoughts and experiences can be obtained from individual interviews. This was also the case in this study, as incorporating individual interviews in this study resulted in rich and detailed data that, despite the original setback due to logistics, coincidentally influenced the study positively.

Ivankova, Creswell and Plano Clark (2008: 257) are of the opinion that semi-structured interviews must be conducted in familiar settings. In this study the chosen setting, the School of Education at a university in South Africa, was familiar to the NS pre-service teachers. Permission was sought and granted by the participants to make audio and video recordings of the focus group discussion and the individual interviews. Video and audio recordings were used to accurately capture the participants’ views while allowing the researcher to be an active listener in the discussion and not to be distracted by note taking. The researcher stored all recorded conversations (both audio and typed) in a secure “password-locked” file on the researcher’s laptop, and all hardcopies in a locked cabinet.

In this study Braun and Clarke’s (2006: 79) six-phase framework for executing thematic analysis was used. Maguire and Delahunt (2017: 3354) explains Braun and Clarke’s (2006) six-phase framework as a step-by-step method that does not necessarily occur as a once-off linear method, but rather a method with phases that can be revisited several times.

The six-phase framework of Braun and Clarke consists of the steps in Table 1 (Maguire & Delahunt, 2017).

Table 1: The six-phase framework of Braun and Clarke for thematic analysis

Steps of the six-phase framework	Execution
Step 1: Become familiar with the data	Reading and re-reading of transcribed data. Rough notes were made during the reading.
Step 2: Generate initial codes	Theoretical thematic analysis was used, as only data relevant to the research questions were coded. Open coding was used as codes developed and were modified during the coding process.
Step 3: Search for themes	Patterns in data were identified and codes collated to develop initial themes.
Step 4: Review themes	Initial themes were reviewed, modified, and further developed. Data relevant to each theme was gathered and “cut and paste” under each theme in Word documents.
Step 5: Define themes	The themes were further refined until the essence of each theme could be identified.
Step 6: Write-up	Themes were reported in the findings section of each article.

This study is presented in the form of two articles, namely (1) *Natural Sciences pre-service teachers’ reflections on Microteaching: a social learning approach*, and (2) *Experiences of NS pre-service teachers during work-integrated learning*. The research design and research methodology implemented produced information on two parts of NS pre-services practical learning, namely microteaching and work-integrated learning that warranted capturing these as separate articles. The exploration of the research objectives from the two articles contributed to answering the primary research question.

ARTICLE 1 TOPIC: NATURAL SCIENCES PRE-SERVICE TEACHERS' REFLECTIONS ON MICROTEACHING: A SOCIAL LEARNING APPROACH

Article 1 reports on the microteaching reflections of the fourth year Bachelor of Education (B.Ed.) pre-service teachers that specialized in Natural Sciences (NS), by imploring a social learning approach. The purpose of microteaching as technique, used to prepare NS pre-service teachers for the world of teaching, remains a contentious issue in teacher education. Understanding the experiences of the NS pre-service teachers, as articulated in their reflections, can be useful in determining the components that need to be strengthened to inform the effectiveness of microteaching in general and for the NS pre-service teachers in particular. Microteaching is used to develop the targeted teaching skills of NS pre-service teachers in simplified classroom settings. This qualitative study, framed within Bandura's social learning theory that evolved into the social cognitive learning theory, used both focus group discussions and individual interviews to generate data. Eight purposefully sampled fourth year NS pre-service teachers were selected to share their microteaching experiences. Open-ended, semi-structured questions, used in the focus group discussion and individual interviews, were related to the phases of microteaching, namely the preparation, presentation, and feedback. The six-phase framework for thematic analysis of Maguire and Delahunt (2017: 3354) was used to make sense of the data generated from the focus group discussion and individual interviews. Findings indicated that the NS pre-service teachers had positive experiences that would need strengthening, and negative experiences that would need attention.

ARTICLE 2 TOPIC: EXPERIENCES OF NS PRE-SERVICE TEACHERS DURING WORK- INTEGRATED LEARNING

The focus of the second article moved from university-based practice researched in article one to the work-integrated learning (WIL) of Natural Sciences (NS) pre-service teachers. The aim of the article was to explore the experiences NS pre-service teachers have about the work- integrated learning (WIL) section of their practical learning. Gaining insight into the WIL experiences of NS pre-service teachers can be useful to strengthen the WIL components to ensure valuable experiences that will produce quality NS teachers. WIL is process whereby NS pre-service teachers introduced to the teaching profession and signifies the first steps into

the teaching profession. WIL provides a nurturing environment that allows NS pre-service teachers to teach under the supervision of an experienced teacher. This qualitative study was based on Bandura's social learning theory that rests upon the notion that observing, imitating and modelling is an important component of learning. NS fourth year pre-service teachers were purposefully sampled to share their WIL experiences. One focus group discussion and four individual interviews were conducted to generate data. The participants were asked open ended questions on their experiences related to the organization and implementation of WIL. The thematic analysis of Maguire and Delahunt (2017: 3354) was used to analyse the data generated from both the focus group discussion and individual interviews. Findings indicated that NS pre-service teachers generally had good experiences during WIL, but that there were issues that at times negatively affected their experiences.

VALUE OF RESEARCH

The practical component of the B.Ed. curriculum aims to prepare competent, effective, and efficient NS teachers by providing these pre-service teachers with what Matoti and Odora (2013: 126) describe as opportunities to integrate theory and practice, to work collaboratively with practicing teachers, and to promote continuing professional development. Planning the components of practical learning requires insight into the conditions that influence the preparation of NS pre-service teachers for the world of teaching. The perceptions and experiences NS pre-service teachers have about the practical learning component of their B.Ed. curriculum could contribute to the body of knowledge by providing valuable information needed to create environments that support NS pre-service teachers to bridge the gap between theory and practice. The research could also contribute to the insights needed by stakeholders in their influence on the continuous development of the practical learning components of ITE.

ETHICAL CONSIDERATIONS

Ethical clearance was obtained from the University of the Free State to conduct the research. The ethical clearance number is: UFS-HSD2019/0120/1402. Permission to conduct the research with the NS pre-service teachers from the School of Education was obtained from Sol Plaatje University. All participants provided informed consent before initiating the focus group discussion and individual interviews. De Vos, Strydom, Fouché and Delport (2017: 116)

agree with Babbie (2011: 67) that participants should not feel forced to participate in any study. To this end, participants were made aware that they could withdraw from the study at any time. Lune and Berg (2017: 46) emphasise the importance of confidentiality of information in a research. Neuman (2014: 155) defines confidentiality as an ethical protection that compels the researcher to not link individuals to their responses. The confidentiality of the data from the focus group discussion and individual interviews was continuously upheld during the study, by ensuring participants were provided with pseudonyms.

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CHAPTER 2

NATURAL SCIENCES PRE-SERVICE TEACHERS' REFLECTIONS ON MICROTEACHING: A SOCIAL LEARNING APPROACH

O. du Plessis, B.B. Moreeng and M. Mosia

Abstract

Microteaching, as part of pre-service teachers' preparation towards teacher effectiveness, remains a contentious issue in teacher training. This paper reports on the reflections of Bachelor of Education (B.Ed.) pre-service teachers, that specialise in Natural Sciences (NS), about microteaching as part of their teaching practice component. Understanding the experiences and perceptions of the NS pre-service teachers can be helpful in determining the components that need to be strengthened to inform the effectiveness of microteaching in general and for the NS classes in particular. Microteaching is a skill-based analytical technique that is used to engage pre-service teachers in practicing their teaching skills in simplified classroom settings. It plays an important part in preparing pre-service teachers for the profession. This qualitative study, framed within an approach based on Bandura's social learning theories, used focus group discussions and individual interviews to generate data. Eight purposefully sampled NS fourth year education students were sampled to share their microteaching experiences. The focus group discussion and individual interviews revolved around the preparation, presentation and feedback phases of microteaching. Thematic analysis was used to make sense of the focus group discussion and individual interviews. Findings indicated that the NS pre-service teachers had both positive and negative experiences that needed strengthening and attention.

Key words: Teacher Education, Teaching Practice, Natural Science Education, Microteaching.

Introduction and background

Teaching has globally been identified as one of the most important factors that have a direct effect on learner performance (Darling-Hammond, 2017: 291). The training of effective science teachers, therefore, plays a key role in the development of science education (Mtsi et al., 2016: 127). Teacher education programmes that are a collection of unrelated courses

(Darling-Hammond, 2006: 306), where the traditional transfer of knowledge is taught implicitly (Ismail, 2011: 1043), rarely result in effective teaching. Darling-Hammond (2017: 291) emphasise that the development of effective teachers is, therefore, dependent on quality teacher education programmes.

Teacher education institutions around the world constantly evaluate and re-evaluate their teacher education programmes. However, the application of theory in practice, often referred to as the theory-practice divide, has remained a central problem for the greatest part of the twentieth century (Korthagen, 2017: 387). Many countries around the world use microteaching in their teacher education programmes (Gödek, 2016: 1473) to prepare pre-service teachers for the application of theory in practice when teaching (Nomlomo & Sosibo, 2016: 209). Ismail (2011: 1043) is of the opinion that microteaching might be part of the answer to bridging the theory-practice divide.

In the South African education context, microteaching is regarded as a “skill-based analytical technique” whereby a pre-service teacher practices a specific skill in a concentrated, scaled down class that reduces the complexities of actual classes (Moreeng, 2015: 94). Microteaching, therefore, provides pre-service teachers with hands-on (Zhou & Xu, 2017: 244), learner-centered teaching experiences (Van der Westhuizen & Golightly, 2015: 240). The South African Policy on the Minimum Requirements for Teacher Education Qualifications (DHET, 2015:10) requires practical learning to occur from and in practice. Learning in practice includes learning in simulated classroom environments (DHET, 2015: 10), such as microteaching environments.

In past literature, numerous studies aimed at substantiating microteaching as an effective technique in teacher training (Yan & He, 2017; Golightly, 2010; Ismail, 2011) that promotes real-time teaching experiences (Remesh, 2013: 158). Marios and Iosif (2016) also investigated teachers’ opinions on microteaching to explore the benefits of the process, while Davids (2016) used the experiences of first-year pre-service teachers to evaluate microteaching. In other studies, the focus shifted from developing pedagogical content knowledge in pre-service science teachers through microteaching lesson study (Kartal, Ozturk and Ekici, 2012) to using microteaching lesson study to prepare pre-service teachers to teach science through inquiry (Zhou & Xu, 2017).

Gödek (2016) researched the experiences of science pre-service teachers to evaluate and increase the effectiveness of microteaching. Although the participants were pre-service science teachers, the study made general suggestions that encourage lecturers to provide constructive criticism within supportive environments. There is a need for research to determine the microteaching experiences of Natural Sciences pre-service teachers in order to make suggestions that could ensure effective practical learning. This study, therefore, seeks to explore the reflections of Natural Sciences pre-service teachers on microteaching, so as to provide valuable insight into determining the microteaching experiences that Natural Sciences pre-service teachers need to make their practical learning component more effective.

Against this background the following research questions guiding the study were formulated.

Main research question: What are Natural Sciences pre-service teachers' reflections on the microteaching part of their teaching practice component?

Sub-research questions:

- What are Natural Sciences pre-service teachers' views on the purpose of their microteaching sessions?
- How do Natural Sciences pre-service teachers experience the microteaching process?
- What are Natural Sciences pre-service teachers' views on the feedback they receive after presenting in a microteaching session?

Microteaching

The microteaching approach in teacher education originated at Stanford University in the United States of America (USA) (Reddy, 2019: 66) in response to finding a teacher training technique that would bridge the gap between theory and practice (Slabbert, 1994: 109). Initially, in 1961, Stanford University used demonstration lessons as a technique to prepare pre-service teachers for teaching (Chowdhary, 2019: 155). A demonstration lesson involves a lesson that is presented by a pre-service teacher to a small group of peers, while the rest of the class observes (Chowdhary, 2019: 155). To address the shortcomings of demonstration lessons, a more robust technique was developed in 1963 to provide introductory experiences in practice teaching (Marios & Iosif, 2016: 73).

Six years later, in 1969, the teacher training technique was transformed by Allen and Ryan into a microteaching model that interrelates various stages in a cyclical process (Arsal, 2015: 142). The stages included planning, presenting, observing, evaluating, re-planning, presenting, and re-observing and evaluating. Arsal (2015: 142) explains that lecturers presented model lesson plans on specific teaching skills that pre-service teachers were required to reproduce.

During the teaching stage pre-service teachers present the lesson in a set time of between 15-20 minutes. The lecturer observes the teaching activities of the pre-service teacher and provides feedback. The lessons are video-recorded and later critiqued during a group discussion. Pre-service teachers use the feedback to plan and present new teacher activities for the same or a new lesson. Pre-service teachers are subsequently assessed on the performance of the improved lesson. Gödek (2016: 1475) emphasises that these stages are cumulative and continuous.

Karlström and Hamza (2019: 45) argue that microteaching can be viewed as having three basic phases: (i) planning, (ii) teaching, (iii) reflecting. Over time, the responsibility of planning the lesson shifts to the pre-service teacher (Arsal, 2015: 145) as planning sets the stage for teaching. During the planning phase pre-service teachers need to make decisions regarding aims and objectives based on policy documents, concepts to be taught, and assessment strategies (Diana, 2013: 151). The teaching phase involves the presentation of a small section of work in a 15-20-minute lesson to a small group of peers that “act” as learners in “simplified” micro-class environments. Finally, in the reflecting phase, lecturers and peers provide constructive feedback to help pre-service teachers to improve their lessons (Golightly & Van der Westhuizen, 2016: 140).

Various changes have also influenced the reflection phase. Pre-service teachers can reflect on their own experience after listening to real time feedback from lecturers and peers. Alternatively, they can watch a recording of their lessons, and reflect on their teaching behaviours that they displayed during their presentations (Diana, 2013: 153). There was also a shift in the type of pedagogical skills developed through microteaching, for example, class management, time management, the question-and-answer technique and bringing a lesson

to a conclusion (Kilic, 2010: 82). Kartal, Ozturk and Ekici (2012: 2754) indicated that advanced stages of microteaching can be used to develop the pedagogical content knowledge (PCK) of pre-service teachers.

Moreeng (2015: 94) pointed out that the fluid nature of microteaching allows for modifications and adaptations to be made according to people's needs, as their context changes. In view of latter statements, the principles that support the implementation of microteaching must be retained irrespective of the adaptations made (Moreeng, 2015: 98). These principles are "confidentiality, respect, honesty, simplicity, high expectations, and shared responsibility and purpose" (Moreeng, 2015: 98).

The advantages of microteaching are numerous and one obvious benefit, that is often overlooked, is the experience that pre-service teachers gain from practicing their teaching skills in class settings (Remesh, 2013: 158; Zhou & Xu, 2017: 244). Davids (2016: 10) notes that microteaching supports pre-service teachers with the "how" of teaching that includes benefitting from practicing how to manage a class, how to project one's voice, how to behave in front of a class and how to project confidence. The safe, relaxed and friendly environment creates a space where interaction and feedback can enhance teaching (Marios & Iosif; 2016:73). Yerdelen, Osmanoglu & Tas (2019: 568) reiterate that constructive feedback motivates pre-service teachers to practice and improve their teaching.

Amid all the benefits discussed, microteaching is not without challenges. These challenges include sessions that lack discipline-specific expertise (Schwartz, Walkowiak, Poling, Richardson & Polly, 2018: 65), time constraints (Zhou & Xu, 2017: 244), and the artificial nature of the environment (Marios & Iosif, 2016: 74). Nomlomo and Sosibo (2016: 212) describe teaching as a complex situation that require teachers to simultaneously manage knowledge and children. In a microteaching setting the management of knowledge and children may not be challenging, as peers act as learners.

Marios & Iosif (2016: 74) attribute this to peers that don't engage as expected because they are bored, either with the school content, or the subject content that differs from their own majors. Pre-service teachers are often reluctant to provide honest feedback as they are sensitive to the emotions of the presenter (Slabbert, 1994: 120). Constructive feedback is

further diminished when the feedback is rushed and poorly structured (Van der Westhuizen & Golightly, 2015: 421).

Natural Sciences Education

Natural Sciences (NS) is a component of the Senior Phase (grades 7-9) school curricula, and is composed of several science areas, namely Life Sciences, Physical Sciences (Chemistry and Physics), and Earth Sciences (DBE, 2011). In recent years the focus of NS education has shifted to the dynamic nature of science, encapsulating scientific knowledge that changes due to the continuous testing of scientific phenomena, reformulation of scientific explanations, and the critical evaluation of different views (Barnhart & van Es, 2015: 84).

Mtsi et al. (2016: 116) emphasize that NS teachers need a thorough understanding of the Nature of Science (NOS) and how it can be taught in a way that is learner-centered and inquiry-based. Once NS pre-service teachers understand how NOS informs the structure of the subject, the fundamental competencies and skills unique to NS teaching can be taught. In 1986, Shulman conceptualized a type of pedagogical content knowledge (PCK), unique to teachers, that distinguishes a teacher from a person that purely studies subject content. Reworking Shulman's original PCK model, Magnusson developed a PCK model that could shape the type of PCK relevant to the teaching of science subjects (Magnusson, Borko & Krajcik, 1999: 98). The five components of the Magnusson model include an orientation to teaching science, knowledge of assessing scientific literacy, knowledge of science-related teaching strategies, knowledge of learners' understanding of science, and knowledge of the science curriculum (Kind, 2016: 124).

Booi and Khuzwayo (2019: 10) recommend that teacher education programmes should assist NS pre-service teachers with acquiring essential science skills and developing the application of science specific teaching strategies in order to promote knowledge integration and innovative science. Notably, the development of competent NS pre-service teachers should be regarded as a prerequisite in order to ensure that the subject is taught effectively. Sanders (2006: 34) affirms that a competent teacher has knowledge about policies in education, pedagogy, methodology, the learner, the development of skills, the learning environment, and PCK. Sanders (2006: 34) emphasizes that science teachers also need to be knowledgeable about practical work and managing a laboratory.

The qualities of a competent Natural Sciences teacher that should be addressed in a teacher education programme are illustrated in Figure 1.

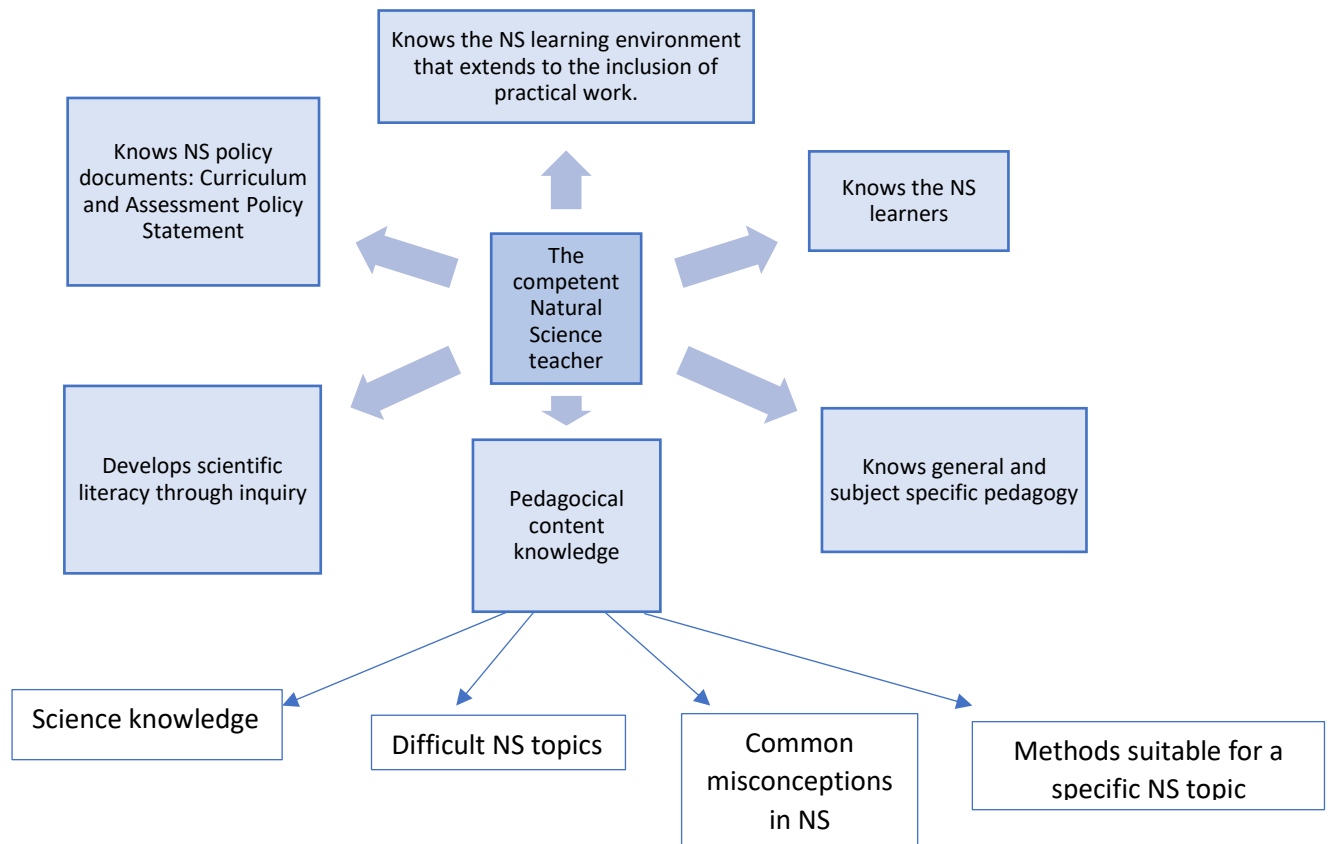


Figure 1: The repertoire of a competent Natural Sciences teacher

Competent NS teachers have a repertoire of skills and knowledge that are unique to the field of NS. The unique skills and knowledge, include PCK, and knowledge of pedagogy, NS learners, the NS environment, NS policy documents, and how to develop scientific literacy through inquiry. Microteaching is used to practice the implementation of skills and knowledge related to teaching (Gödek, 2016: 1475) and is therefore an ideal technique for developing the unique repertoire of competent NS teachers.

Theoretical Framework

In this study the NS pre-service teachers' reflections on microteaching were framed by a social learning approach. The social learning approach is based on Albert Bandura's social cognitive theory (SCT) (1986), that developed from his initial social learning theory (SLT) (1977). Bandura's SLT (1977) explicates that people learn behaviour from others in a social context through observing, imitating and modelling (Nabavi, 2012: 6). The assumptions made from

Bandura's SLT (1977) are that learning occurs through observation, and that learning does not always result in a change of behaviour. Behavioural change requires the influence of mediational processes that occur between observation and imitation (Sukimin, 2021: 241).

Bandura (1977) proposed four mediational processes required to change behaviour, namely attention, retention (remembering the modelled behaviour), reproduction (replicating the modelled actions), and motivation (Edinyang, 2016: 42; Nabavi, 2012: 8; O' Rorke, 2006: 72). Schraw, Crippen and Hartley (2006: 112) discern that learning centers around social guidance at the imitative level. Discipline-specific lecturers should, therefore, provide social guidance during microteaching, as feedback from contradicting practices can cause disconnection, and ultimately confuse pre-service teachers (Schwartz et al., 2018 :65).

The observer must be motivated to change the behaviour that is indirectly influenced by reinforcement and punishment (O' Rorke, 2006: 72). The presenter, peers, and lecturer engage in social reflection (Kourieos, 2016:73) during microteaching, providing either reinforcement or punishment. Peers and lecturers should therefore provide constructive feedback (Baştürk, 2016: 240) in order to reinforce and motivate good modelling practices by NS pre-service teachers.

People will "adopt" and ultimately model the behaviours, values, beliefs and attitudes of the person observed, if they perceive the model as prestigious (O' Rorke, 2006: 72). Davids (2016: 11) notes that pre-service teachers often replicate behaviour, modelled by their school teachers, that is not always aligned to sound theory. A more viable option would be for NS pre-service teachers to model the behaviour of teaching experts. Microteaching, as a teacher training technique, therefore, plays a pivotal role in training pre-service teachers (Önal, 2019: 807), by providing NS pre-service teachers with a platform on which they can model the application of theory to practice, thereby demonstrating changed behaviour.

Newman and Newman (2015: 157) highlight that Bandura incorporated a strong cognitive aspect of learning in his SLT (1977) and subsequently developed the SCT (1986). Bandura (2006: 164) emphasises that people use "self-organisation, pro-activeness, self-regulation, and self reflection" to contribute to their own behaviour. Zhou and Brown (2015: 28) state

that an important assumption of Bandura's SCT (1986) is that cognitive functions of the person, such as self-reflection and self-regulation, are parts of an individual's consciousness that can be changed and developed. Zhou and Brown (2015: 28) further indicate that the proposition therefore exists that self-efficacy can also be enhanced.

Cartwright and Smith (2017: 182) highlight that a limited understanding of science and anxiety, caused by inferior science experiences, negatively influences the self-efficacy of NS pre-service teachers in teaching science. Schraw et al. (2006: 112) are of the opinion that the application of Bandura's SCT (1986) in an educational setting leads to the development of self-regulated learning in individuals that have strong self-efficacy beliefs and have a range of cognitive strategies.

Microteaching can increase pre-service teachers' self-efficacy beliefs (Arsal, 2015: 143), as the teacher training technique gives pre-service teachers opportunities to gain valuable experience, strengthen their decision-making skills, and develop their self-confidence to teach (Önal, 2019: 809). NS pre-service teachers can influence their own teaching performance through the reciprocal interactions of personal factors, environmental circumstances, and their behaviour. The social learning approach assists to view the focus of the study, i.e. the reflections of NS pre-service teachers on microteaching in the light of learning as a social construct.

Research Design and Research Methodology

A qualitative research methodology was chosen as the study explored (Babbie, 2011: 95) the reflections of NS pre-service teachers on microteaching. This enabled the researcher to develop an in-depth understanding (Vass et al., 2017: 299) of microteaching in the B.Ed. programme at a new university in South Africa. Qualitative research was suitable, as Nieuwenhuis (2008: 50) also emphasises that qualitative research is a collection of descriptive data in a particular context to develop an in-depth understanding of the phenomena under research. Not underscoring the theoretical aspect of this study, qualitative research also allows the researcher to be concerned with the people's experiences within the social context in which the phenomena occur (McMillan & Schumacher, 2010: 14).

The approach allowed the researcher to examine the reflections of NS pre-service teachers in order to unearth their perceptions and describe individual and common experiences within the social context of these experiences. Systematic exploration was used to actively and purposefully seek “discoveries” (Hussein et al., 2014: 4). An open mind to discoveries was employed, as research in a new context may, according to Babbie (2011: 20), yield unexpected data. Through this approach the researcher was further able to explore the operational aspects of microteaching, as well as the social interactions that take place during microteaching. More importantly, the research participants were given opportunities to voice their opinions about their experiences from their own perspectives in a more informal, non-threatening manner, that they might not have been able to do whilst writing formal reflections for course work.

Data generation methods

A focus group discussion and individual face-to-face interviews were used as the main data generation strategies in this study. A focus group discussion is defined as a process of acquiring information systematically through simultaneous semi-structured interviews in a group (Babbie, 2011: 343; Memduhoglu et al., 2017:275). The semi-structured interviews included open-ended questions (Babbie, 2011: 343) that were predetermined as a means to keep the discussion focused (Jamshed, 2014: 87).

Focus group discussions are fluid (Gulliksen & Hjordemaal, 2016: 6), allowing the discussion to develop beyond the pre-planned questions to information initiated by participants as they discuss their microteaching experiences. The purpose of following the deviation of participants’ discussions was to ensure authentic accounts (Lune & Berg, 2017: 70) of the participants’ perspectives and experiences. There were four participants that could not join the focus group discussion, due to various logistical reasons. This setback was positively merged into the study as these participants agreed to engage in individual face-to-face interviews.

The individual face-to-face interviews assisted with collecting detailed information on the perceptions, thoughts, and experiences (Lambert & Loiselle, 2007: 229) of the participants’ microteaching. This was achieved by streamlining the questions that were used in the focus

group discussion to focus more pertinently on microteaching. Lune and Berg (2017: 81) reminds researchers that communication through an interview is not a natural exchange. This encouraged the researcher to continuously listen and respond to information related to participants' reflection on their microteaching. With permission from the participants, audio and video recordings were made of both the focus group discussion and individual face-to-face interviews. The use of video and audio recordings assisted the researcher to actively listen to the discussion without being distracted by note taking.

Site description and study participants

The fourth year NS pre-service teachers were selected as participants through non-probability purposive sampling (Etikan, Musa & Alkassin, 2015: 2) from the B.Ed. group in order to ensure an in-depth study (Arseven, 2018: 120) of microteaching. The target group consisted of 20 participants and eight students agreed to take part in the study. In this study, the focus group discussion and individual interviews were conducted within the specific context (Onwuegbuzie & Collins, 2007: 287) of the School of Education at a University in South Africa, providing participants with a familiar setting that was convenient and comfortable.

Data analysis procedures

Thematic analysis in this study occurred through the six-phase framework postulated by Braun and Clarke (2006: 79). The six-phase framework consist of the following steps: (1) becoming familiar with data, (2) generating initial codes, (3) searching for themes, (4) reviewing themes, (5) defining themes, and (6) writing up (Braun & Clarke, 2006: 79; Maguire & Delahunt, 2017: 3354). In this study, step one involved the reading and re-reading of transcribed audio and video recordings to ensure familiarity of the data. In step two, segments of data relevant to the sub-research questions were coded. Step 3 involved collating overlapping codes into initial themes. In step four, the initial themes were reviewed and modified. In step five, themes were further refined and the essence thereof defined. Finally, in step six, themes were written up.

Ethical considerations

Ethical clearance was obtained from the University of the Free State research office and permission to conduct research was also granted by the university at which the study was

conducted. The ethical clearance number is UFS-HSD2019/0120/1402. Voluntary participation was sought from participants after explaining the aim of the study and the process involved. Participants were also informed that they could withdraw from the study at any stage. The researcher chose pseudonyms for each participant and made every possible effort to present data in a way that did not allow for easy identification of participants (Frankfort-Nachmias & Nachmias, 1992: 86).

Findings

In this section, the findings are presented in response to the sub-research questions, i.e. (i) what are NS pre-service teachers' views about the purpose of their microteaching sessions?; (ii) how do NS pre-service teachers experience the microteaching process?; and (iii) what are their views on the feedback they receive after presenting in a microteaching session? Data are represented in themes that emerged from the participants' responses as generated from individual interviews and focus group discussions.

Natural Sciences pre-service teachers' views about the purpose of microteaching

Microteaching, as a teacher training technique, assists in bridging the theory-practice divide (Marios & Iosif, 2016: 74; Arsal, 2015: 143). In microteaching, pre-service teachers practice teaching skills and apply teaching strategies before being confronted with real and complex classroom situations (Marios & Iosif, 2016: 73). The data generated from the individual interviews and focus group discussions show that NS pre-service teachers' view microteaching as an opportunity to apply what they learnt in theory to practice.

From the focus group discussion, the idea that microteaching prepares NS pre-service teachers for the world of teaching emerged. Lorato alluded to this when she said:

... with the teaching strategies, but I think the way we going to go about. I think the microteaching really helps.

Felix, a participant from the individual interviews, focused his response on the application of pedagogy in practice, when he said:

We need to show ... what we have learnt in the pedagogy to check if we can put that into practice.

Another participant, Margarete, expressed her view of the purpose of microteaching in an analogy:

[Microteaching] prepare[s] us for the actual teaching...it is like the building blocks of actual teaching. I'm much more confident to become and do teaching now... so I'm feeling much more like I can do this.

Arsal (2015: 143) postulates that microteaching effectively increases self-efficacy beliefs and reduces the anxiety pre-service teachers experience before going to schools. The reflective practice of microteaching can assist NS pre-service teachers to build confidence and improve their teaching. Boipelo, a participant in the individual interviews said:

Since it's only a few students who you are in class with, I think it builds your confidence... [You] are able to identify your mistakes, and also come with ways on how to improve them. So when you go to teaching practice, you are confident enough to know you have a good subject content knowledge, and also you know how to teach it to the learners.

Anastasia, a participant from the focus group discussion, reiterated Boipelo's view that microteaching can improve NS teaching. She points out how observing your peers teach a difficult NS topic, provides a different perspective on the topic. She said:

It helps when for instance Jesse or Lerato presents a certain topic, then as a student teacher you are able to see I can do it like this or like that. So now I am thinking if I was going to go about it my way, it was not so right. If you see it with other people in conversation [it is better]...

The findings indicate that NS pre-service teachers view microteaching as a technique that is used to practice the application of pedagogy in preparation for teaching, while improving their teaching and building their self-efficacy.

Natural Sciences pre-service teachers' experiences of the microteaching process

The participants in this study had only been exposed to microteaching from the third year of their B.Ed. programme. Lorato, a participant from the focus group discussion, experienced the late exposure to microteaching as problematic. She said:

In the beginning of the third year... We were only exposed [in microteaching] to like the introduction of a lesson and one teaching strategy. So now you go to the school and then only maybe focus on that one you really know.

Other participants confirmed that the late exposure to microteaching hindered the use of teaching strategies that are perceived as difficult. Jesse reported that she found it difficult to cope with problem-solving as a teaching strategy. She said:

I wasn't chosen to present problem solving. So now I don't know if I can teach problem solving. I refrain from teaching because I in some I don't know why, but problem solving is a problem teaching strategy for me.

Lorato indicated that NS preservice teachers were not confident to use problem-solving as a strategy, due to a lack of practice. Lorato articulated this when she said:

I think it feels like a problem, because you weren't exposed to it. You didn't practice it at least once.

Ralph (2014: 23) found that, although pre-service teachers initially experience uncertainty or nervousness about teaching their peers, they do, however, in time see the benefits of teaching their peers. The initial nervousness pre-service teachers experience when they teach their peers for the first time is captured in the words of Margarete as she describes her first experience. She said:

I was very nervous. When I started, my voice started doing things and I thought just relax, the moment you start getting comfortable, you are a totally different person.

NS pre-service teachers identified the supportive environment as a benefit of microteaching. Boipelo, a participant from the individual interviews, indicated that peer support can result in a positive microteaching experience, when she said:

So we did help each other... We have friends and they did assist us on how to improve, encourage us and motivate us.

However, excessive peer support was viewed as counterproductive to the microteaching experience. Anastasia commented on peers that responded too quickly when the question-and-answer method was used. She articulated this when she said:

Everyone will raise their hands in the class. Whereas in the real school everyone just looks at you and then you have to pick on them.

Lorato added that peers always gave the correct response. She said:

Anastasia already know everything about what I am going to teach so obviously she is going to give the correct answer.

In an individual interview, Felix echoed how counterproductive excessive support from peers can be during microteaching:

They [NS pre-service teachers] are fast. If you ask [learners a] question automatically, there will be uncertainty.

NS pre-service teachers view the authenticity of microteaching as questionable, due to various factors. Anastasia, a participant from the focus group discussion compared the “acting” of learners to actual learners, when she said:

In the real life context, trying to do the group work or the inductive, because the learners are not so much exposed to that. It's difficult.

The authenticity of NS pre-service teachers’ microteaching was compromised, as certain content topics were deliberately chosen above others. In an individual interview, the participant Kagiso articulated that content topics were chosen based on what was easy for the presenter and peers, when he said:

Let me just choose something I am best at. Plus, I think the people [Life Science majors] are just more aware when they start from the zygotes, but if you talk of things like electricity there's a lot of confusion around those.

The findings suggest that exposing NS pre-service teachers to microteaching from the 3rd year of the B.Ed. programme, may not be timeous, resulting in difficult teaching experiences. The supportive environment of microteaching contributed to positive teaching experiences for NS pre-service teachers. Furthermore, overly protective support on occasion influenced the authenticity of the microteaching experience.

Natural Sciences pre-service teachers' views on the feedback they received in microteaching

The views of NS pre-service teachers indicated that they preferred feedback from their own NS lecturers. Margarete, a participant from the focus group discussion, highlighted that lecturers that were not familiar with NS mostly focused their feedback on general pedagogy. She said:

It does help sometimes to have ... your subject teacher there. If there is another teacher... they are more focused on the pedagogy part [whereas] your feedback has to include your content as well.

In an individual interview, Boipelo indicated that NS lecturers give feedback that assists NS pre-service teachers to improve their lessons, when she said:

I prefer the one who teaches natural sciences content. Because there you get enough feedback as compared to [others] they sometimes do not know a lot of, of natural sciences content and ... sometimes the feedback that we get doesn't help us enough into improving on the other lessons.

The views of NS pre-service teachers indicated that they also value the feedback they get from their peers. Felix, a participant from the individual interviews articulated this, when he said:

...the feedback that we got from our peers was very much important to build on what we already know.

In another individual interview, Boipelo had the same view when she said:

[Peers] play a role in assessing one another. Helping to improve, especially where we had to introduce the content. We have friends and they did assist us, encourage us and motivate us.

Kagiso, on the other hand, explained in his individual interview that reluctant peers gave superficial feedback. He indicated this when he said:

...the only feedback that I got really from them is just that my time was, over time. But there's really nothing much that I got from them. Maybe they once commented on my board work.

The findings suggest that NS pre-service teachers valued the constructive feedback they received from both NS lecturers and peers. The inadequate feedback came from lecturers that focused on pedagogy without content, and from reluctant peers that commented on superficial issues.

Discussion of findings

This study explored the reflections of Natural Sciences pre-service on microteaching in order to gain insight into the experiences needed to make the practical learning component of the Natural Sciences pre-service teachers B.Ed. curriculum more effective. A social approach based on Bandura's SLT (1977) and SCT (1986) was used to conceptualize the findings.

Natural Sciences pre-service teachers' views about the purpose of microteaching

The findings of this study indicate that NS pre-service teachers viewed microteaching as a preparatory technique that is useful for practicing the application of theory in practice. These findings align with Gödek's (2016: 1490) findings that indicate simulated environments give pre-service teachers opportunities to practice the application of theory. In an earlier study, Ismail (2011: 1043) also found that the practical application of theory is a notable benefit of microteaching.

As part of microteaching, NS pre-service teachers reflect on their own microteaching lessons and that of peers. Pre-service teachers can, through reflection, become systematically aware of the sources that influence their behaviour, enabling them to learn from their experiences (Korthagen, 2011: 36). Davids (2016: 13) recognised that learning from one's own microteaching experiences can prepare pre-service teachers for pedagogical reasoning. NS pre-service teachers revealed that reflecting on their experiences improved their teaching and subsequently increased their self-confidence and their self-efficacy beliefs. Cartwright

and Smith (2017: 182) reason that the effectiveness of science teachers as facilitators of learning is significantly impacted by their beliefs of their teaching related science skills. The development of self-confidence and self-efficacy align with the SLT (1977), as the reinforcement of behaviour can contribute towards positive microteaching experiences. Arguably, if NS pre-service teachers' self-efficacy beliefs are shaped during microteaching, they may become more self-assured NS teachers.

Natural Sciences pre-service teachers' experiences of the microteaching process

The findings in this study indicate that the timing of when NS pre-service teachers are exposed to microteaching, in relation to when they are expected to teach in schools, is crucial to bridging the gap between theory and practice. This is confirmed by literature which indicates that pre-service teachers need more than theory classes; they need to try out the different teaching strategies that they learnt in order to ensure some practical experience before they teach in schools (Fernandez & Robinson, 2006 in Ismail, 2011: 1044).

Bektas (2015: 51) highlights that making choices during the execution of instructional strategies based on specific content topics improves the PCK of NS pre-service teachers. In addition, Zhou and Xu (2017 :243) state that NS pre-service teachers should specifically practice teaching science through inquiry-based instruction. The presentation of scientific processes that encourage active involvement in science laboratories assist learners to understand science better (Mtsi & Maphosa, 2016: 59). It therefore stands to reason that NS pre-service teachers should be given opportunities to practice their teaching of science process skills in a microteaching environment located in science laboratories.

The findings suggest that teaching NS peers can create a safe and meaningful environment. This view is supported by research from Golightly and Van der Westhuizen (2016: 141), who found that peers play an important role in providing encouragement during learning. NS pre-service teachers reported that an overly protective environment hindered the practice of difficult strategies such as inductive reasoning. Similarly, Gödek (2016: 1489) found that the artificial environment may result in a teaching environment that has a disproportionately high possibility of teaching effectively.

The discussion in this section is in line with the SLT (1977) in that NS pre-service teachers clearly expressed the view that they may exhibit behaviours learnt during microteaching. Nervousness can be unlearned and problem-solving skills may be strengthened after having been given opportunities to be autonomous during microteaching lessons.

Natural Sciences pre-service teachers' views on the feedback they received in microteaching

The findings in this study indicate that NS pre-service teachers valued feedback from both their NS lecturers and peers. Microteaching can increase the awareness of SMK (subject matter knowledge) and PCK (pedagogical content knowledge) through reflection (Gödek, 2016: 1475) and constructive feedback. Feedback is also a source of encouragement and motivation that elevates the need of each pre-service teacher to perform better and improve with each lesson (Marios & Iosif, 2016: 73). Literature also indicates that pre-service teachers can use the feedback they receive from lecturers and peers to improve their teaching skills (Gödek, 2016: 1475).

The findings in the study indicate that NS pre-service teachers value feedback from their NS lecturers. The NS pre-service teachers reported that content specific feedback and improvement guidelines assisted them to advance their NS teaching. Schwartz et al. (2018: 63) confirm this by highlighting that methods course lecturers involved in microteaching can mitigate problems caused by competing discourses. In early studies, Slabbert (1994: 124) emphasised that methods course lecturers can address the “what” and “how” that should be taught, by assisting pre-service teachers to transfer general pedagogy and principles to a specific discipline.

The findings suggest that the feedback of peers can be valuable, especially in instances where lecturers involved are not subject specific lecturers. NS pre-service teachers reported that their peers gave supportive feedback and, in most instances, the feedback was constructive. Literature indicates that experiencing reflective collaboration with peers can prepare teachers for peer-supported learning throughout their careers (Korthagen, 2011: 40). It therefore stands to reason that NS pre-service teachers can be prepared for peer-supported learning through microteaching.

The findings indicate that superficial feedback is a result of reluctant peers that want to rush through the reflective stage of microteaching. NS pre-service teachers reported that reluctant peers gave obvious and superficial feedback, rather than constructive feedback that could be used to improve teaching. Literature indicates that sufficient time must be incorporated for feedback, as inadequate reflection can diminish the pedagogical value of microteaching (Davids, 2016: 14). If time does not allow for synchronous real time oral feedback, then NS pre-service teachers should be given opportunities to reflect in asynchronous times by means of video recordings.

The issue of feedback aligns with the assumptions of Bandura's SCT (1986) that holds the view that when NS pre-service teachers are to learn from and reproduce the behaviours they observe in their role models, self-efficacy is foregrounded. If NS pre-service teachers receive positive reinforcement (feedback), they may act with more confidence in themselves and their abilities, creating a desire to repeat such behaviour.

Conclusion

The purpose of the study was to explore Natural Sciences pre-service teachers' reflections on microteaching. In the study the social learning approach, consisting of Bandura's SLT (1977) and SCT (1986), was applied. SLT (1977) is based on the notion that people learn through observing others. SCT (1986) is based on an agency perspective which suggests that people are self-developing, self-regulating, self-reflecting, and proactive.

The study revealed that NS pre-service teachers regard microteaching as a valuable teacher training technique, that provides support from peers that specialise in NS and constructive feedback from NS peers and NS lecturers to improve teaching. The study supports literature that views microteaching as a teacher training technique that provides a connection between theory and practice (Arsal, 2015: 143). The findings align with another study which indicates that microteaching develops the teaching skills of pre-service teachers (Marios & Iosif, 2016: 76).

Although the complexities of teaching have been reduced (Marios & Iosif, 2016: 74), the microteaching experience is by no means a compromised teaching experience (Moreeng,

2015: 96). This study advances the knowledge of microteaching as a useful training technique that improves the teaching skills of NS pre-service teachers by determining what they need from their views and experiences. The findings indicate that microteaching is viewed as by NS pre-service teacher's general pedagogy rather than a microteaching environment unique to NS. The microteaching environment should be structured in a manner that is unique to NS and can contribute to the development of the qualities of competent NS teachers. Microteaching sessions should incorporate sufficient time for feedback from peers and lecturers, as feedback is cardinal to the process of social learning. Lecturers and NS pre-service teachers alike should, therefore, be much more aware of the impact feedback has on professional development.

The limitation of the study centres around NS pre-service teachers that reflected without viewing their own video-recorded microteaching lessons. Pre-service teachers that reflect on video recordings of their own performance in microteaching can pin-point the behaviour related to the comments of peers and lecturers (Van der Westhuizen & Golightly, 2015 :434) aimed at improving their teaching skills (Yerdelen et al., 2019: 568). Further research could focus on NS pre-service teachers' metacognitive reflections, based on their video-recorded microteaching sessions.

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CHAPTER 3

EXPERIENCES OF NS PRE-SERVICE TEACHERS DURING WORK-INTEGRATED LEARNING

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Abstract

This paper reports on the experiences that Natural Sciences (NS) pre-service teachers had about their work-integrated learning (WIL) component as part of their practical learning. Understanding the WIL experiences of NS pre-service can be useful in determining what NS pre-service teachers need to have valuable WIL experiences that contribute to producing quality NS teachers. WIL involves the induction of NS pre-service teachers into the teaching profession through nurturing environments that are supervised by experienced teachers. This qualitative study is framed by Bandura's theory of social learning that resides in the notion that observation and modeling contribute to learning. Fourth-year NS pre-service teachers were purposefully sampled and asked to share their WIL experiences. Data was generated through the participation of NS pre-service teachers in a focus group discussion and individual interviews. Open-ended questions were posed on placement at schools, the roles of mentors, and the involvement of lecturers during WIL. The thematic analysis of Maguire and Delahunt (2017: 3354) was used to make sense of the data generated from the focus group discussion and individual interviews. The findings indicated that NS pre-service teachers valued their WIL experiences, even though there were some difficulties that they needed to overcome.

Key words: Teacher Education, Teaching Practice, Natural Science Education, Work-Integrated Learning (WIL).

Introduction and Background

Work-integrated learning (WIL) is a strategy of applied learning that combines academic study and working in practice with professional reflection in a structured educational program (Reinhard & Pogrzeba, 2016: 230). McRae and Johnston (2016: 341-342) reviewed various WIL programmes around the world and examined the experiential learning theories of various researchers to propose a global WIL framework. The key features of the proposed global WIL framework by McRae and Johnston (2016) include experience in a workplace environment, curricular integration of academic and workplace learning, development of skills and attributes that are relevant to the workplace context, and reflection.

Hay (2020: 52) and Bogo (2015: 319) recommend that the successful implementation of WIL require that any organisational context adhere to four principles, namely (i) available and supportive relationships, (ii) promotes learning and practicing with assistance and autonomously, (iii) encourages conceptual and reflective practices, and (iv), facilitates the mastery of skills through observation, reflective discussions, and constructive feedback. Smith (2012: 247) agrees that WIL should integrate authentic learning with teaching and learning activities that are aligned with supervised assessment.

In the South African context, WIL is described as the component of a student's professional development in a specialised career field that integrates periods of academic learning with periods of workplace experience (Van Vuuren, 2020: 4). In education, WIL involves demonstrating "structured, supervised and assessed learning" of educational practices in a school environment that are aligned to a professional teaching qualification (Van Vuuren, 2020: 5). The revised policy on the minimum requirements for teacher education qualifications (MRTEQ) provides guidelines for WIL in initial teacher education (ITE). These guidelines assert that WIL takes place in the workplace, i.e. the school environment, and include learning both from and in practice (DHET, 2015: 10). Learning from practice during WIL includes observing and reflecting on lessons taught by teachers, while learning in practice requires the planning, teaching and reflection of pre-service teachers in terms of their own lessons (DHET, 2015:10).

Researchers across the globe agree that the experiences of pre-service teachers in actual schools and in authentic classroom settings are an indispensable part of preparing quality teachers (Bahr & Mellor, 2016: 50; Darling-Hammond, 2006: 307; Zeichner & Bier, 2015: 38). Research that has been conducted on aspects of WIL, includes coherence between course work and clinical work (Darling-Hammond, 2006), the views of distance education students on teaching practice (Du Plessis, Marais, Van Schalkwyk & Weeks, 2010) and the responsibility of schools in practicum (Bahr & Mellor, 2016). Developing knowledge and skills of pre-service teachers through practical experiences is clearly not a new addition to ITE programmes. However, there is a renewed emphasis on structuring effective learning experiences during WIL (Aprile & Knight, 2020: 870). The learning experiences that transpire during WIL can, therefore, be regarded as an essential component in the practical training of NS pre-service teachers. Given the importance thereof, great demands have been placed on the social learning experiences of NS pre-service that unfold during WIL. Considering the renewed emphasis on WIL, more research related to the WIL experiences of NS pre-service teachers is required.

This study sought to explore the NS pre-service teachers' experiences and perceptions of WIL as a component of their B.Ed. programme in the context of a new South African University.

This study aimed to address the following research questions:

Main research question: What are Natural Sciences pre-service teachers' experiences and perceptions of their WIL component?

Sub-research questions:

- How do Natural Sciences pre-service teachers experience school placements during WIL?
- What are Natural Sciences pre-service teachers' views about the roles of mentor teachers during WIL?
- How do Natural Sciences pre-service teachers' experience feedback and assessment from lecturers during WIL?

This study can contribute to the body of knowledge by exploring the experiences of NS pre-service teachers during WIL. The exploratory research could yield valuable information

needed to create effective WIL experiences (Smith, 2016: 19) for the quality training of NS pre-service teachers.

Work-integrated learning in Education

Teaching is inherently a complex profession that requires knowledge, skills and dedication from the teacher (Mudzielwana, Joubert & Phatudi, 2016: 191) to fulfil numerous roles. Quality training will equip pre-service teachers for the complex profession of teaching by developing the skills needed to manage the responsibilities of the classroom (Nwanekezi, Okoli & Mezieobi, 2011: 41), whilst enabling them to teach effectively (Mtsi et al., 2016: 114). Rusznyak (2016: 208) is of the opinion that five essential elements need to be taught individually and connectedly to prepare pre-service teachers for the teaching profession. The five elements include the teacher, knowledge of content to be taught and learnt, learners, pedagogy, and the context of teaching.

WIL is a component of the B.Ed. programme that, according to Mudzielwana et al. (2016: 192), plays an important role in the development of pre-service teachers, because it is during this time that pre-service teachers learn to use their newly acquired knowledge to effectively teach learners in schools. WIL is then a platform that provides pre-service teachers with opportunities to experience teaching in an actual teaching environment (Nwanekezi et al., 2011: 41). Dlamini (2018: 87) agrees that WIL involves the placement of pre-service teachers in schools for a specified period of time to practice their teaching.

Pre-service teachers practice transferring theory and skills acquired in formal lectures to real classroom situations, where they then learn from the workplace, while simultaneously preparing for the workplace (Mudzielwana et al., 2016: 193). Pre-service teachers experience the meaning of the teaching profession by observing lessons, learning to teach, reflecting on teaching, and engaging with professional teachers (Van Vuuren, 2020: 6). The actions of pre-service teachers in the school and classroom take place under the supervision and guidance of mentor teachers (Du Plessis, 2013: 29). Mentor teachers and lecturers assess the teaching of pre-service teachers in a classroom setting in order to determine their professional competence (Van Vuuren, 2020: 24, 28).

Although learning in practice has been recognised as an integral part of teacher preparation programmes, the practice is not without challenges (Aprile & Knight, 2020: 870). Davies, Dickson, Rickards, Dinham, Conroy, and Davis (2015: 523) note that it is common practice for pre-service teachers that are placed in schools to observe seemingly invisible and unarticulated aspects of practice. This type of unstructured learning continues to plague ITE, despite the development of procedures and processes by researchers such as City, Elmore, Fiarman and Teitel (2009: 3) that address observing, analysing and discussing the tacit knowledge that is associated with learning in practice.

Natural Sciences Education

NS is a school subject that integrates various science disciplines, namely physical sciences (chemistry and physics), Life Sciences and Earth Sciences. In the South African school curriculum Natural Sciences is offered at Senior Phase level (Grades 7 to 9). The South African Department of Basic Education (2011: 9) asserts that learners must learn and use scientific knowledge in the interest of society and the environment. The principles that frame Natural Sciences as a learning area encourages the development of scientific literacy (Mtsi et al., 2016: 110) in all learners, fostering economic and socially responsible citizens. Producing competent NS teachers depends on the effective development of NS pre-service teachers' Pedagogical Content Knowledge, or PCK (Coe, Aloisi, Higgins & Major, 2014: 19; Kind, 2015: 2).

PCK is created when pedagogical knowledge is intertwined with knowledge of learners, as well as subject matter knowledge (Schneider, 2015: 185). Numerous researchers have refined the concept of PCK, originally coined by Shulman (1986) to develop a model that can be used in ITE. One such model is the Magnusson model (Magnusson et al., 1999) that focuses specifically on PCK for science teachers (Kind, 2015: 3). The Magnusson model (1999) comprises five components, namely orientation to teaching science based on the nature of science, knowledge of assessing scientific literacy, knowledge of teaching strategies, knowledge of learners' understanding of science, and knowledge of the science curriculum (Bektaş, 2015: 41).

In 2003, Black researched the transition made by pre-service science teachers from their methods courses to the classroom. The study revealed that pre-service teachers experienced

challenges in classroom management and acquiring resources for practical work. Mtsi and Mpahosa (2016: 58) found that even NS teachers faced numerous challenges due to a lack of infrastructure and resources essential for teaching NS. Singh and Singh (2012: 168) propose that the improvisation of practical work should be infused in science methods courses to prepare pre-service teachers to use improvised equipment in practical work. In a recent study, Boo and Khuzwayo (2019: 10) found that there were discrepancies between what the science curriculums expect science teachers to know, and science teacher training. Considering that a discrepancy may exist, a concern arises that NS pre-service teachers may not be adequately prepared for what is expected of them.

In response to similar challenges, Botha and Reddy (2011: 259) propose a reformulation of science teacher knowledge, as published by authors Shulman (1986), Grossman (1990), Magnusson et al. (1999), and Carlsen (1999). The reformulated science teacher knowledge domains by Botha and Reddy (2011) include knowledge about the general educational context and knowledge about specific classroom contexts. Specific classroom contexts encapsulate general pedagogical knowledge, subject matter knowledge (syntactic structures of science, substantive structures of science, nature of science and technology) and PCK (common misconceptions, specific science curricula, topic specific instructional strategies, purposes for teaching science). The quality training of NS pre-service teachers, therefore, requires the acquisition of knowledge on subject matter, learners and how learners learn, pedagogy, and context. The acquisition of these knowledge types requires, according to Mpofu and Maphalala (2018: 7), a range of practical learning experiences that include WIL in schools.

Theoretical framework

The social learning theory (SLT) of Albert Bandura (1971) is based on the notion that an individual learns by observing and imitating the attitudes, values and behaviours of a role model (Wang, Xu & Liu, 2018: 693). Bandura, Adams and Beyer (1977: 126-127) note that participant modelling involves an instructor that models the behaviour before allowing the subjects to attempt the behaviour. Performances that are considered difficult are broken down into steps that are mastered with increasing difficulty. In instances where the task becomes too difficult for the subject to complete on their own, a joint performance is

facilitated by the instructor. The subjects then perform tasks for longer periods of time and engage in self-directed performance.

The implication of Bandura's (1977) SLT for teaching is, according to Mudzielwana et al. (2016: 196), the influence mentors have on the development of a mentee's teaching knowledge. Effective participant modelling by mentor teachers requires the scaffolding of learning across the zone of proximal teacher development (Van Wyk & De Beer, 2019: 278; Warford, 2011: 252). The zone of proximal teacher development is based on the theory of Vygotsky's (1978) zone of proximal development. This then suggests that pre-service teachers must internalise the theoretical knowledge and practical skills modelled by mentors to reach a point where they are able to facilitate their own teaching (Mudzielwana et al., 2016: 196).

Bandura expanded his theory of social learning by adding a focus on human cognition to the framework of learning (Nabavi, 2012: 11). Bandura's (1998) new version of his social learning theory soon became known as social cognitive theory (SCT). Nabavi (2012: 15) is of the opinion that self-efficacy lies at the heart of SCT, highlighting that belief in one's own abilities influences behaviour. Bandura (1998) refers to four factors that influences self-efficacy, namely mastery experiences, vicarious experiences, social persuasion, and physical and emotional states. Palmer, Dixon, and Archer (2015: 28) explain that mastery experiences refer to performance accomplishments, while vicarious experiences refer to modeling the behaviour of others, and social persuasion includes verbal persuasion that centers around receiving feedback on one's abilities. The physical and emotional state provides the information used to judge one's own level of anxiety.

Bandura's SCT, with an underlying focus on self-efficacy, has implications for the WIL experiences of NS pre-service teachers. The vicarious experiences indicated by Bandura speak to the roles of mentor teachers and lecturers. Mentor teachers provide professional assistance (Mudzielwana et al. 2016: 197) by creating a conducive learning environment, observing the pre-service teacher, giving constructive feedback, and working beside them (Ambrosetti & Dekkers, 2010 :47). Mentor teachers are, therefore, viewed as role models that must display good teaching practices (Nkambule, 2017: 194) that support (Maphalala, 2013: 128) and guide (Mukeredzi, 2013: 94) pre-service teachers.

Social persuasion influences teaching and learning, because of the reciprocal relationships (Nkambule, 2017: 194) that occur within school and classroom context. Reciprocal relationships are fostered when, as stated by Mudzielwana et al. (2016: 196-197), mentoring teachers have positive and nurturing relationships with pre-service teachers, provide positive reinforcement by supporting creative efforts, are encouraging, and provide varied teaching opportunities. This provides NS pre-service teachers with opportunities to learn from good role models and to participate in mastery experiences, as echoed by Bandura's (1998) SCT.

Bandura's (1977) SCT not only has implications for mentor teachers that model behaviour and give feedback, but also for the lecturers of these NS pre-service teachers. During WIL, lecturers give pre-service teachers feedback on how to improve their teaching and assess their performance against criteria prescribed by the higher education institution (HEI) (Nyaumwe & Mavhunga, 2005: 135; Van der Walt, Van der Bijl, Alexander & Palm-Forster, 2016: 228). Rusznyak and Bertram (2015: 53) are of the opinion that the assessment of pre-service teachers' WIL can be problematic if the criteria used are too generic. Rusznyak and Bertram (2015: 32) point out that knowledge of the subject and pedagogy should be used to assess the teaching competency of pre-service teachers. Feedback from mentor teachers and lecturers influences the mastery experiences of NS pre-service teachers and ultimately their self-efficacy. It is for this reason that researchers such as Du Plessis, Marais, and van Schalkwyk (2011: 28), and Le Grange and Beets (2005: 115), agree that assessment should form an integral part of the teaching and learning process.

Research Design and Research Methodology

A qualitative research design was implemented, as data were collected in a particular context with the aim of understanding the studied phenomena (Nieuwenhuis, 2008: 50). This study aligned with exploratory research (Babbie, 2011: 95), as the experiences of Natural Sciences pre-service teachers during WIL in the context of a new university was explored.

Site description and study participants

Participants were fourth-year pre-service teachers that specialised in Senior Phase Natural Sciences at a new university in South Africa. The participants completed their WIL periods in 18 different schools, with each individual participant being exposed to three different schools.

Of the 18 schools, nine were in the Kimberley region. The other nine schools attended were in the Northern Cape, North West and KZN provinces near their family homes. Only three of these schools were in towns, while the other 15 schools were in townships.

Data collection

Data were obtained by conducting one focus group discussion and four individual interviews. Convenience sampling was used, as there were limited numbers of NS pre-service teachers available for interviews amidst their end-of-year responsibilities. Generally, focus group discussions involve the acquisition of information systematically through discussions that take place in small groups (Babbie, 2011: 343; Memduhoglu et al., 2017:275). This study had only one focus group discussion and the NS pre-service teachers that could not attend the discussion indicated that they were prepared to participate in individual face-to-face interviews. Semi-structured interviews (Babbie, 2011: 343) were used during the focus group discussion and individual interviews in order to keep conversations focused by asking predetermined open-ended questions (Jamshed, 2014: 87). The open-ended questions allowed the discussions to go beyond the predetermined questions, providing opportunities to probe interviewees on information that they mentioned (Lune & Berg, 2017: 70).

Data analysis procedures

Maguire and Delahunt (2017: 3354) suggest that there are six interrelated steps that can be used to analyse qualitative data. In this study the six steps were used as guidelines to analyse the data. In step one, data were organised and prepared for analyses. This process included transcribing audio and video recordings into written text, and reading the text. The second step involved manually coding the data. In step three the coded data were organised into themes that related to answering the sub-research questions. In step four the themes were reviewed and in step five the themes were defined. Step six involved presenting the themes under the findings section. Finally, the findings were interpreted to answer the research question, namely what are the perceptions and experiences of NS pre-service teachers of their WIL component?

Ethical considerations

Ethical clearance to conduct research was obtained from the University of the Free State research office; number: UFS-HSD2019/0120/1402. The purpose of the study and interview process were explained to the participants at the beginning of each interview. Participants were requested to sign consent forms before the interviews commenced. The participants were also informed that their participation was voluntary and that they could withdraw from the study at any time. Information that could be used to identify transcripts were kept separate from the transcripts and recordings in order to ensure confidentiality and anonymity.

Findings

In this section, the findings are presented in response to the sub-research questions, namely (i) How do NS pre-service teachers experience school placements during WIL?; (ii) What are NS pre-service teachers' views about the roles of mentor teachers during WIL?; (iii) How do NS pre-service teachers' experience feedback and assessment from lecturers during WIL? The open-ended questions that were posed to participants during the focus group discussion and individual interviews yielded data that were analysed and presented as themes in light of answering the sub-research questions.

Natural Sciences pre-service teachers' experiences of school placement during work-integrated learning

The placement of NS pre-service teachers at various schools during WIL emerged as a theme from the NS pre-service teachers' responses. NS pre-service teachers indicated that they experienced challenges in the uncondusive learning contexts found at some schools. In an individual interview, Kagiso indicated that his first WIL experience was very challenging. He indicated that language was a barrier during his first WIL experience:

That was actually my worst experience, because of the language. I just couldn't hear a thing. They were speaking this thing, Khoi language and then in class it was mostly Afrikaans if their teachers are teaching.

Lorato indicated that the reality of schools that have large class contexts can result in overwhelming WIL experiences, when she said:

I was doing reflection of light and the I did group work with them, but because it is such a big class ... there were 10 groups. The ones in the front were focusing, but those ones at the back they were so undisciplined.

Although some of the NS pre-service teachers were overwhelmed by the reality of teaching in township schools, others found that these schools offered valuable learning experiences. Mpho noted that the under-resourced schools could inadvertently yield fulfilling learning experiences. She said:

I was the one that was doing the demonstration, because they don't have whiteboards or resources. ...they [learners] were so engaging and everything.

Felix also expressed that he felt empowered to teach practical work by being required to improvise, when he said:

We are given an opportunity to learn there. When you go to schools there is no materials there, so you have [to] improvise.

NS pre-service teachers indicated that town schools also had challenges with conducting practical work. Fully resourced schools often do not engage learners in practical work as it is time consuming and shifts the focus away from preparing for tests. Jesse said:

... the teachers they have the resources to engage learners, but they prefer not to use it. They do PowerPoints and just read from the PowerPoints or they read from the textbooks or have learners take down notes. They don't actually engage the learners.

During an individual interview, Felix also alluded to this when he said:

Most teachers like Natural Science, they only focus on content. They don't they don't believe that much in terms of materials and so forth. They view that as something that is wasting time.

The findings suggest that NS pre-service teachers were exposed to similar challenges in different schools. Although the contexts differed, the challenges centred around a crucial component of NS, namely practical work.

The views of Natural Sciences pre-service teachers about their mentor teachers during work-integrated learning

The influences of mentor teachers featured prominently in the NS pre-service teachers' responses. It emerged from their responses that some viewed their mentor teachers as a source of inspiration that supported and guided them. Margarete explained how her mentor teacher compassionately encouraged her when she was too nervous to teach. She said:

This one day I was very, very shy. Then she called me and said just calm down, just talk to them like it's your class. Then I started teaching properly.

In addition, Lorato indicated how compassion and sympathy from a mentor teacher could foster perseverance amidst difficult teaching circumstances:

I wanted to cry. The mentor she was asking do I want to do my lesson over because she could see. And she said she was even feeling it for me.

Boipelo from the focus group discussion explained that she could use the feedback that she received from her mentor to improve her teaching. She said:

[Mentor teachers] even observe your lessons, after each lesson they give you feedback based on your lesson where you can improve. They also give you inputs, how to discipline them, if you find certain challenges, how to address them.

Kagiso, from the individual interviews, also indicated that mentor feedback was constructive, when he said:

She was always there to guide me. She always you know, said okay, your lesson went well, but you know, you just need to fix there and there, maybe your time management as well.

There were some NS pre-service teachers' whose responses indicated that their mentor teachers hindered the success of their WIL. Anastasia indicated that mentor teachers did not supervise lessons or give guidance when she said:

They just give you the class and then you just have to deal. There is not much supervision to say, I think you can do this better, this is how you better can handle the learners or whatever so they are not so much hands on with us student teachers, not much guidance going into it.

Kagiso, in one of the individual interviews, articulated that he too experienced this, when he stated:

Now, you have observed enough now you just take this class and teach. When I'm not there you teach.

Kagiso also articulated how his WIL experience was negatively affected by the strained pre-service mentor teacher relationship, when he said:

We couldn't communicate and you know I got reported several times I think. And some things they actually made me sad because I didn't realise they were happening and she didn't even tell me that they were happening.

The negative attitudes and mediocre work of some mentor teachers easily deterred NS pre-service teachers during WIL. Anastasia, from the focus group discussion, articulated this when she said:

Sometimes you fall into the trap of what's happening in that particular school. The attitude of the teachers, maybe they are bored, they are tired, they don't like the content and then you fall into that trap.

The NS pre-service teachers' WIL was hampered, as mentor teachers did not adhere to the nature of science in their NS teaching. In certain instances, this was on purpose, while in others it was due to a lack of content knowledge. From the focus group discussion Jesse articulated this when she said:

What I have noticed at school is that teachers are afraid to do practicals and investigations when it's not for marks. Afraid it will take up too much time. They rather prefer to read or talk and chalk.

In the individual interview Kagiso expressed that NS teachers struggled with certain topics when he said:

Teachers that are teaching Natural Sciences are struggling. I think they also have gaps they have big gaps. Because on one school I went the teacher told me you see you helped me by coming. See now this whole chapter is yours.

During the focus group discussion Mpho gave another example of a NS teacher that lacked knowledge on a certain topic when she said:

There is one; she is the HoD of Sciences. But then she does not even know what the iron filings are, when I came with it. She asked what is this.

As the focus group discussion progressed, Anastasia gave her view as to what may contribute to the issue of content knowledge amongst NS teachers. She stated that:

The schools that I have been in is that there are shortages ... This English teacher who has been teaching almost 25 years English, and now she has been given Natural Sciences.

Participants from the individual interviews and focus group discussion respectively indicated that the mentoring they received from mentor teachers could be improved if the university communicated their expectations. Kagiso said the following:

Train teachers that we are going to get classes from or observe from. ...training to what is expected from them.

Anastasia expressed the same sentiment when she said:

I think the exposure where the instructions are clearer to the mentors.

NS pre-service teachers expressed how good mentor teachers were at encouraging and motivating them to improve on their teaching. NS pre-service teachers received no

supervision and guidance from ineffective mentors as they had to teach lessons on behalf of mentor teachers that were not comfortable with the content or because the mentor teachers wanted to do other work.

Natural Sciences pre-service teachers' views on lecturer feedback and assessment during work-integrated learning

Participants' responses provided insight into the value NS pre-service teachers placed on the feedback that they received from their subject specific lecturers. In an individual interview, Margarete expressed these views when she said:

The feedback from your content lecturer always counts more than what this other lecturer is perhaps saying.

In another individual interview, Boipelo articulated a similar sentiment, when he said:

The feedback that we get [from other lecturers] doesn't help us enough into improving on the other lessons.

Feedback that is constructive and developmental in nature requires motivation and support. In an individual interview Kagiso articulated this, when he said:

I really think is very important to keep us all motivated. The things that we do right it just need to be applauded as well. I think just to hear those words, especially coming from your lecturer, they mean a lot.

The quality of NS pre-service teachers' teaching is not adequately addressed when lecturers give non-descriptive feedback. Anastasia from the focus group discussion articulated how she could not gauge the quality of her lesson, due to minimal feedback. She said:

The only thing that she [the lecturer] wrote was what wonderful lesson. So I really couldn't say what did I do wrong what did I do right. So most of the other lecturers don't give very much constructive feedback of how you can improve.

Linked to the above statement, Lorato also expressed how vague feedback caused her some confusion when she said:

When the class was over he was giving me nice comments. When I saw my marks I was like, it can't even be the same lesson.

The participants in the focus group discussion highlighted discrepancies between the assessment standards of different lecturers. Anastasia articulate how she would avoid assessment by subject specific lecturers to gain higher marks:

If I know [the NS lecturer] is coming, I will always want to ditch her. I will wait for the other lecturer, maybe the Setswana one or whatever. I know she will give me good marks even though I just fumble.

Anastasia added to her response:

I mean, the emphasis is more on the marks than on how to improve.

The discrepancies between the assessment standards of different lecturers influenced the quality of work NS pre-service teachers presented. Lorato, very honestly explained what she did when preparing for her assessment lessons. She said:

If I know maybe I am teaching Natural Science..., I'll make sure like everything that maybe she [the NS lecturer] has taught me is there. If someone comes that I know is not really knowledgeable on the on the subject. I will [just] do it.

The NS pre-service teachers' responses indicated that there should have been a balance between the assessment and feedback they received. They indicated that the university should acquire the services of subject specific mentors that have the time to give constructive feedback. Kagiso articulated this when he said:

Some they [lecturers] even leave between classes, because there are other students at varsity that have to still get classes. Maybe employ more mentors for the development of us students. The mentor is going to sit down with you and say okay this is what went right, this is what went wrong, you can improve like this.

The findings suggest that NS pre-service teachers valued the feedback they received from their subject specific lecturers. They would, however, manipulate situations to ensure that they would be assessed by lecturers that were not NS lecturers. The findings suggest that the discrepancies between lecturer assessment standards resulted in NS pre-service teachers sacrificing feedback in favour of higher marks.

Discussion of findings

This study aimed to explore the experiences and perceptions that NS pre-service teachers had of WIL as a component of their B.Ed. programme in the context of a new South African University. The experiences and perceptions of NS pre-service teachers may provide valuable insight into determining the WIL experiences that are needed to ensure effective training of NS pre-service teachers.

Natural Sciences pre-service teachers' experiences of school placement during work-integrated learning

The findings align with research from Van der Walt et al. (2016: 226) that indicates that varying backgrounds should be considered during school placements. In particular, the language of the NS pre-service teachers should be given careful consideration when school placements are made to ensure productive learning experiences. Van der Walt et al. (2016: 226) are of the opinion that pre-service teachers should be exposed to schools that have diverse cultures, languages and contexts.

The findings indicate that some NS pre-service teachers did not have access to diverse schools, possibly limiting their exposure to diverse contexts, resulting in compromised WIL experiences. Singh and Singh (2012: 177) state that teachers continue to use “chalk and talk” instead of using scientific inquiry, because of limited resources, high class numbers, and time constraints in completing the science curriculum. However, Black (2003: 8) found that pre-service teachers may actually have similar experiences at different schools. The findings of the study support this, as NS pre-service teachers experienced similar challenges as those found by Black (2003: 8), namely differences in the teaching styles, limited teaching time, and difficult classroom situations.

NS pre-service teachers that were given opportunities to engage learners in practical work, experienced mastery experiences, as postulated by Bandura (1998), in the SCT. The findings suggest that, when they improvised equipment and engaged learners in practical work, the learners reacted positively, reinforcing the feeling of accomplishment and thereby increasing their self-efficacy beliefs.

The views of Natural Sciences pre-service teachers about their mentor teachers during work-integrated learning

Du Plessis (2013: 37) highlights that successful mentors attribute their success to personal attributes, the modelling of good teaching practices, expression of pedagogical knowledge, addressing the requirements of the school system, and providing pre-service teachers with constructive feedback. The findings align with the attributes of successful mentors, as NS pre-service teachers' responses suggest that good mentors motivate, encourage, are enthusiastic, and give constructive feedback. These qualities are also corroborated by Mudzielwana et al. (2016: 197), who state that good mentor teachers act as role models that encourage and empower pre-service teachers.

In stark contrast to these attributes the findings suggest that the learning experiences of NS pre-service teachers, who had ineffective mentor teachers, were characterized by strained relationships, and science teachers' negative attitudes and limited content knowledge. The findings are corroborated by research by Mutemeri and Chetty (2011: 513), who found that strained relationships between mentors and mentees resulted in compromised learning experiences in schools. The findings suggest that limited content knowledge and poor innovation negatively impacted the quality of practical work by NS mentor teachers, and diminished the quality of guidance that they could offer. These findings are aligned with studies conducted by Kibirige and Teffo (2014: 516), who found teacher's had dismissive attitudes towards practical work, and Muwanga-Zake (2000: 2), who observed that teachers struggled with practical work, because they had limited knowledge of science concepts and the associated science processes.

Mutemeri and Chetty (2011: 514) indicate that the expectations of universities are often inadequately communicated to mentor teachers. The findings align with studies by Du Plessis (2013: 30), who indicates that lecturers and mentor teachers should work together to ensure

effective mentoring, and Maphosa, Shumba, and Shumba (2007: 305), who suggest that universities should host workshops that will empower mentor teachers to effectively guide pre-service teachers during their time at school.

The NS pre-service teachers will, according to the SLT of Bandura (1977), model the values, attitudes and behaviours of mentor teachers that were viewed as positive role models. Mentor teachers supervise the teaching of NS pre-service teachers and guide their teaching within the zone of proximal teacher development (Van Wyk & De Beer, 2019: 278). The scaffolding of learning to teach develops the ability of NS pre-service teachers to teach effectively and to engage in self-directed performance.

Natural Sciences pre-service teachers' views on lecturer feedback and assessment during work-integrated learning

Shulman (1986: 9) defined PCK as a type of knowledge that goes beyond the subject to a type of subject teaching knowledge. Teachers that have sufficient PCK can effectively teach science content to their learners (Bektaş, 2015: 41). Slabbert (1994: 126) is of the opinion that methods course lecturers are specialists in their field that can guide the development of PCK. NS pre-service teachers would sacrifice feedback on the use of PCK from subject specific lecturers for higher assessment marks from lecturers that were not NS specialists. These findings align with Getu and Teka (2018: 173), who concluded that the feedback given to pre-service teachers mainly focused on general pedagogy.

When NS pre-service teachers were not assessed they indicated that feedback from subject specific lecturers was motivational and constructive with concrete suggestions. These findings support literature from Du Plessis et al. (2010: 37), who found that engaging in dialogue diminishes the confusion experienced by pre-service teachers when they interpret feedback. The findings also concur with suggestions from Van der Walt et al. (2016: 228), i.e. that lecturer feedback should include supportive suggestions that focus on improving the teaching of pre-service teachers.

The experience of receiving motivation and constructive feedback from lecturers formed the social persuasion identified by Bandura (1998) as a contributing factor of self-efficacy. It

therefore stands to reason that motivational and constructive feedback (social persuasion) from lecturers positively influence NS pre-service teachers' self-efficacy for teaching NS.

Conclusion

Schools chosen for the placement of pre-service teachers should have the type of environment that perpetuates active learning (Du Plessis et al., 2010: 338). Therefore, placement strategies should not only ensure that NS pre-service teachers are exposed to diverse contexts, but should also consider the background and language of the NS pre-service teacher. The placement of NS pre-service teachers in diverse school contexts provides them with a platform on which they can engage learners in practical work, even in difficult circumstances.

Mentor teachers should, according to Du Plessis et al. (2010: 338), provide NS pre-service teachers with emotional support, opportunities to develop their professional teacher identities, and positive learning environments. Bandura (1998) proposes that the behaviour of role models will only be imitated if these models are perceived to have desirable characteristics. NS pre-service teachers viewed good mentor teachers as role models of inspiration that provided support and guidance and would therefore imitate their behaviours.

On the other hand, NS pre-service teachers identified that limited content knowledge or not engaging learners in practical work were undesirable behaviours that would not be imitated. Shulman (2004) states that the wisdom of practice lies not only in the study of practice but also the evaluation of pedagogical knowledge (Hudson, English, Dawes, King & Baker, 2015: 135). The academic learning of NS pre-service teachers should reinforce that good mentor teachers use PCK effectively to teach NS, ensuring that these mentors are viewed as desirable role models, whose behaviours are then imitated. Mentor teachers should also know what is expected of them and universities should collaborate with schools to achieve this (Mokoena, 2017: 131).

The limitations of this study are that NS pre-service teachers' lessons were not observed, and their written reflections were not analysed. Data could therefore not be triangulated to support and generalise the findings of this study. Taking the limitations of the study into

consideration a contribution can be made to the body of knowledge. The findings provide valuable information that can be used to determine the experiences needed by NS pre-service teachers during WIL in order to adequately prepare them for the teaching profession.

Producing quality NS teachers will require NS subject specialists to provide NS pre-service teachers with substantiated lesson assessments and constructive feedback (Du Plessis et al., 2010: 35) that has enough detailed information to improve their teaching performance (Brown & Glover, 2006: 81). Mpofo and Maphalala (2018: 8) add that a collaborative assessment model should be used to assess the teaching performance of NS pre-service teachers at schools. Future research could, therefore, focus on the influence of peer and mentor assessment in a collaborative approach during WIL.

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CHAPTER 4

CONCLUSION AND SYNTHESIS

This study sought to explore Natural Sciences pre-service teachers' experiences and perceptions of the practical learning component of their B.Ed. curriculum. Bandura's social cognitive theory (SCT) and his earlier social learning theory (SLT) were used to frame the study. The study was conducted in the form of two academic articles. Article one focused on the Natural Sciences pre-service teachers' reflections on Microteaching: a social learning approach, and article two focused on the Experiences of Natural Sciences pre-service teachers during work-integrated learning. SLT (1977) is based on the notion that people learn through observing others. SCT (1986) is based on an agency perspective that suggests people are self-developing, self-regulating, self-reflecting, and proactive. Based on the themes that emerged from the qualitative data, the experiences, and perceptions of NS pre-service teachers indicate that microteaching and work-integrated learning (WIL) are valuable constructs of the practical learning component of their B.Ed. curriculum.

Microteaching is a teacher training technique that builds the self-efficacy beliefs of NS pre-service teachers and prepares them for WIL and, eventually, the world of work. The teaching behaviours of experts are imitated during microteaching and upon positive reinforcement modelled during WIL. Peers, lecturers, and mentor teachers play pivotal roles in creating a supportive environment that is conducive to learning-to-teach. It should not be taken for granted that peers know how to provide support during microteaching or that teachers know how to mentor NS pre-service teachers. Peers and mentor teachers should explicitly be prepared for their supportive role in a social learning context.

This study has shown that NS pre-service teachers may experience microteaching and WIL as fruitless if they are not sufficiently exposed to feedback that is pertinent to improving their teaching. Positive reinforcement through constructive feedback is fundamental to the process of social learning. It is, therefore, vital that feedback by peers, mentor teachers, and lecturers is constructive in nature and focuses on pedagogical content knowledge (PCK), rather than on feedback that is driven by general pedagogy.

This study has important implications for the practical learning of Natural Sciences pre-service teachers. The relatively traditional approach of microteaching and WIL can be used to successfully enhance the teaching of NS pre-service teachers if all involved provide quality support and constructive feedback. The limitations of this study should be considered when the implications for Natural Sciences pre-service teachers are interpreted. The perceptions and experiences of Natural Sciences pre-service teachers were explored only through data collected from interviews. The conclusion of this study is, therefore, not based on the triangulation of various data collection methods. Further research could involve collecting data from individual interviews that are a follow-up of focus group discussions, document analysis of written reflection and observations of NS pre-service teachers' teaching during microteaching and WIL.

APPENDIX A

Ethical Clearance Letter



GENERAL/HUMAN RESEARCH ETHICS COMMITTEE (GHREC)

14-Feb-2020

Dear Mrs Du Plessis, Odette Elizabeth O

Application Approved

Research Project Title:

Natural sciences pre-service teachers' experiences and perceptions of the practical learning component of their BEd curriculum.

Ethical Clearance number:

UFS-HSD2019/0120/1402

We are pleased to inform you that your application for ethical clearance has been approved. Your ethical clearance is valid for twelve (12) months from the date of issue. We request that any changes that may take place during the course of your study/research project be submitted to the ethics office to ensure ethical transparency. Furthermore, you are requested to submit the final report of your study/research project to the ethics office. Should you require more time to complete this research, please apply for an extension. Thank you for submitting your proposal for ethical clearance; we wish you the best of luck and success with your research.

Yours sincerely

Prof Derek Litthauer

Chairperson: General/Human Research Ethics Committee

Digitally signed

by Derek

Litthauer

Date: 2020.02.15

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APPENDIX B

Permission Letter



OFFICE OF THE DEPUTY VICE-CHANCELLOR: ACADEMIC SOL PLAATJE UNIVERSITY

Private Bag X5008, KIMBERLEY, 8300
Luka Jantjie House, Chapel Street, KIMBERLEY, 8301
Tel: +27 (0)53 491 0360
e-mail: maryjean.baxen@spu.ac.za
Website: www.spu.ac.za

Feedback on a research proposal submitted:

NATURAL SCIENCES PRE-SERVICE TEACHERS' EXPERIENCES AND PERCEPTIONS OF THE PRACTICAL LEARNING COMPONENT OF THEIR BED CURRICULUM – MS O DU PLESSIS

Dear Ms O du Plessis

The letter serves to inform you of the outcome of your research proposal which was submitted to Sol Plaatje University.

Outcome:

- a) Clarity should be given on the sampling methods.
- b) Clarity with regards to the data sets which will be drawn from (other than what is already stated) and how these will be triangulated.
- c) Due to the self-reporting nature of the study, more clarity is required with regards to how the experience of the students will be captured.
- d) The proposal should be re-submitted with an explanatory document as an attachment.

Kind regards,

Prof Mary Jean Baxen

DVC: Academic

29 July 2019

APPENDIX C

Information leaflet and consent form



RESEARCH STUDY INFORMATION LEAFLET AND CONSENT FORM

Date of Study: 2019

Dear Natural Science Education Student

PERMISSION TO CONDUCT RESEARCH

I, Odette du Plessis: Student no. 1998053977, hereby request you to participate in a focus group interview as part of my Masters studies at the University of the Free State.

The title of my research project is Natural sciences pre-service teachers' experiences and perceptions of the practical learning component of their BEd curriculum.

The purpose of the study is to explore the experiences and perceptions that natural sciences (NS) pre-service teachers have about the practical learning component of their BEd curriculum. The perceptions that NS pre-service teachers have about the practical learning component of their BEd curriculum could provide the South African University with the valuable information needed to create an environment that supports NS pre-service teachers during their professional preparation.

You are under no obligation to participate in the study or take part in the focus group interviews. The focus group will participate in interviews at a convenient time on the William Pescod campus. The focus group interviews will be no longer than 2 hours of 3 sessions. The information gathered will be private and will not be shown to any other person. Identifying information will be stored in password protected files and on hard copy, separate from the reporting data, to ensure confidentiality of the data. The data obtained will only be used for my Master studies.

Please feel free to contact me or my supervisor should there be any questions or problems. If you would like to be informed of the final research findings or you require any further information, please contact Ms. OE du Plessis. Should you have concerns about the way in which the research has been conducted, you may contact Dr. BB Moreeng.

Thank you for taking time to read this information sheet and for participating in this study.

Yours sincerely,

Ms OE DU PLESSIS (RESEARCHER)

Dr BB MOREENG (STUDY LEADER)

Contact: 082 5553227

E-mail: Odette.duPlessis@spu.ac.za

Contact: 053 4910249 / 0732691760

E-mail: Boitumelo.moreeng@spu.ac.za



CONSENT TO PARTICIPATE IN THIS STUDY

I, _____ (participant name), confirm that the person asking my consent to take part in this research has told me about the nature, procedure, potential benefits and anticipated inconvenience of participation.

I have read (or had explained to me) and understood the study as explained in the information sheet. I have had sufficient opportunity to ask questions and am prepared to participate in the study. I understand that my participation is voluntary and that I am free to withdraw at any time without penalty (if applicable). I am aware that the findings of this study will be anonymously processed into a research report, journal publications and/or conference proceedings.

I agree to the recording of the interview during the focus group discussion.

I have received a signed copy of the informed consent agreement.

Full Name of Participant: _____

Signature of Participant: _____ Date: _____

Ms OE DU PLESSIS (RESEARCHER)

Dr BB MOREENG (STUDY LEADER)

Contact: 082 5553227
E-mail: Odette.duPlessis@spu.ac.za

Contact: 053 4910249 / 0732691760
E-mail: Boitumelo.moreeng@spu.ac.za

APPENDIX D

Interview Protocol

NATURAL SCIENCES PRE-SERVICE TEACHERS' EXPERIENCES AND PERCEPTIONS OF THE PRACTICAL LEARNING COMPONENT OF THEIR BED CURRICULUM

The study explores the fourth year Natural Sciences pre-service teachers' experiences and perceptions of the practical learning component of their B.Ed. curriculum in the context of a new university in South Africa.

A focus group discussion and individual interviews of a group of fourth year Natural Sciences pre-service teachers, who were part of the 2016 B.Ed. cohort at a new university in South Africa enabled the exploration of NS pre-service teachers' perceptions and experiences of the practical learning component of their B.Ed. curriculum.

Focus Group Discussion and Individual Interviews

Questions:

1. You are a preservice natural sciences senior phase teacher. What do you consider to be the most important attributes a natural sciences senior phase teacher should have?
2. In your understanding, what is the purpose of the practical learning component of your B.Ed. curriculum?
3. What are your views on the experiences you have had, during practical learning?
4. What in your view are valuable aspects that were covered during your practical learning?
5. What in your view are aspects that were not addressed during your practical learning?
6. What aspects of practical learning do you think should be enhanced?

Individual Interviews

Additional questions:

1. What is the purpose of microteaching?
2. What are your views on the experiences you have had, during microteaching?

3. What in your view are valuable aspects that were covered during microteaching?
4. What in your view are aspects that were not addressed during microteaching?
5. What aspects of microteaching do you think should be enhanced?

APPENDIX E


Letter from Language Editor

To whom it may concern

I hereby declare that I language edited the present research report developed by Ms Odette du Plessis in respect of obtaining her Master's degree in Education at the UFS.

For more information, please contact me via e-mail at gert.hanekom@spu.ac.za.

Your sincerely


A handwritten signature in black ink, appearing to read 'Gert Hanekom', is written over a horizontal line.

Gert Hanekom

APPENDIX F

Turnitin report



Digital Receipt

This receipt acknowledges that Turnitin received your paper. Below you will find the receipt information regarding your submission.

The first page of your submissions is displayed below.

Submission author: Odette du Plessis
Assignment title: Masters Article - Part 1 (Moodle 114524253)
Submission title: NATURAL SCIENCES PRE-SERVICE TEACHERS' EXPERIENCES A...
File name: turnitintool_1813617621.Masters_Odette_30_Nov_2021_Turni...
File size: 161.55K
Page count: 68
Word count: 21,833
Character count: 129,683
Submission date: 30-Nov-2021 10:37AM (UTC+0200)
Submission ID: 1716203517

ORIENTATION OF THE STUDY

Learner achievement around the world has been influenced by one crucial factor, namely teacher effectiveness (Darling-Hammond, 2017: 292). The need for teacher effectiveness in science is supported by the call of Muis et al. (2016: 114) for properly trained science teachers that can cultivate scientific knowledge. The importance of scientific knowledge is highlighted when Mui et al. (2006: 209) suggest that the economic development of a country depends on the scientific knowledge cultivated during the teaching and learning of science in schools.

Park and Suh (2018: 550) state that extensive research has been done to determine the knowledge bases of teachers, especially the pedagogical content knowledge (PCK) needed to develop teacher effectiveness. Schneider and Plakman (2011: 192) are of the opinion that science teachers use PCK to support learners in the learning of science. PCK is described by Schneider and Plakman (2011: 192) as knowledge of science, knowledge of the learner, knowledge of the context, and knowledge of general pedagogy. A competent teacher is not only knowledgeable, but also has the following attributes: professional skills, a positive attitude, and an interest in education (Narasimani et al., 2017: 14). Teachers use these attributes, combined with subject matter knowledge, pedagogical content knowledge, and contextual knowledge (Cochran, 1997; Shulman, 1986: 9), to teach science effectively.

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du Plessis, Odette - (1 Submission)

Part 1: NATURAL SCIENCES PRE-SERVICE TEACHERS' EXPERIENCES AND PER...

171630/11/26% |