

Analysing the Instructional Challenges Experienced by Distance Education Pre-Service Teachers During Mathematics Teaching Practice

Mapula G. Ngoepe and Moshe M. Phoshoko
Department of Mathematics Education, University of South Africa,
P.O. Box 392, 0003 UNISA, Pretoria, South Africa

Abstract: The purpose of this study was to investigate the challenges that influence Open Distance Learning (ODL), pre-service teachers in the implementation of pedagogical theories in diverse classroom contexts during the teaching practice part of their training programme. A qualitative research approach in the form of a case study involved the collection of data by means of a questionnaire in which views of students who were registered for a teaching qualification were sought. The pre-service teachers were asked to state the problems that they encountered during teaching practice. The results were classified into 8 themes, namely; classroom management, learners negative attitudes, handling large classes, learners poor communication, learner assessment, interruptions of the teaching routine, lack of mentor guidance and passivity of learners that hindered diagnosis and understanding of new concepts. The results point to problems mainly attributed to local school contexts, such as shortages of resources, poor seating arrangements in the classroom and absence of mentor teachers to assist the pre-service teachers to create conducive learning environments. The ODL pre-service teachers who had no access to face-to-face tuition to enable them to emulate exemplary approaches of university tutors implementation of learner-centered pedagogical approaches faced a number of challenges that are reported in this study. Findings from the study can challenge and inform debate on designing field experiences for pre-service teachers.

Key words: Pedagogical theories, discursive classroom contexts, learner-centred, pre-service teachers, open distance education

INTRODUCTION

Teaching practice is an opportune time for pre-service teachers to practise the pedagogical skills that they learn in their teacher education programmes in diverse school contexts (Mason, 1997). It is during teaching practice that pre-service teachers can learn how to assess the relevance of the various pedagogical methods proposed in didactics theory and their efficacy in the real classroom. For instance in the theory component of their course, pre-service teachers are often encouraged to implement constructivist learning environments that emphasise student learning of mathematics with understanding through active construction of new knowledge from their prior knowledge and intuition (NCTM, 2000). A study by Von Glasersfeld (1988), suggests that mathematical reforms encourage the use of constructivist learning approaches because they offer several advantages. The underlying approach of constructivist learning environments is to promote individual or social constructions of mathematical concepts and this can

enhance learners deep understanding, establish relationships between concepts across topics, as well as across different subjects and improve insight into how to apply concepts to routine and non-routine problems.

In line with these constructivist learning environments, the South African Institute for Distance Education (SAIDE) views learner-centeredness as a key component of any learning environment. Thus, the notion of the learner as an active participant in the construction of knowledge rather than a passive recipient of knowledge is at the centre of effective learning in other words, learners are encouraged to participate in a social process of building concepts from their own experiences and intuitions as well as those of their peers. Learner-centered teaching approaches are encouraged in order to develop the independence, critical thinking and problem-solving skills of learners in line with the national outcomes-based education system in South Africa. This system seeks to encourage teachers to perform their duties in line with the 4 reform expectations of: Teaching, learning, assessment and use of technology (NCTM, 2000).

According to Kaufman and Sawyer (2004), teachers have individual sets of priorities that inform their discipline, classroom management styles and instructional practices. These priorities are multi-determined, stemming partly from teachers personal attributes and partly from the school culture (Nespor, 1987; Rosenholtz, 1989). Some instructional practices and strategies are learned at institutions where the teachers do their training, some are acquired through on-the-job socialisation in schools and some are learned through interventions by the department of education which are designed to help teachers develop their classroom management and instructional skills. As far as classroom management is concerned, Larrivee (2000) argues that those entering the teaching profession will need to find ways to create authentic learning communities by changing the power dynamics from power over learners into power with learners. This approach is informed by the call to change teaching styles in order to align them with emerging metaphors of teachers as social mediators, learning facilitators and reflective practitioners. Larrivee (2000) elaborates on the foregoing by stating that teachers adjustment to these roles begins with the teachers themselves through self-awareness, self-inquiry and self-reflection and not with the students. To emphasise the argument that becoming an effective teacher involves considerably more than the mere accumulation of skills and strategies, Larrivee uses the metaphor of building a wall.

Without tying teaching and management decisions to personal beliefs about teaching, learning and development, a teacher will have only the bricks. The real stuff of teaching is the mortar what holds the bricks in place and provides a foundation. Being successful in today's classroom environment goes beyond taking on fragmented techniques for managing instruction, keeping students on-task and handling student behavior. It requires that the teacher remain fluid and able to move in many directions, rather than stuck only on being able to move in one direction as situations occur (Larrivee, 2000).

The challenge for pre-service teachers and teachers in general is how to accomplish the change in the power dynamics with the aim of exercising power with the learners rather than over them. For teachers to succeed in teaching mathematics effectively according to this model, it is important for them to be aware of the prior knowledge that learners possess and to understand the learning challenges the learners may face and the support mechanisms that are necessary to enable them to grasp what they are learning. As far as learners are concerned, learning mathematics incorporates active involvement

of the construction of mathematical concepts and relationships either from previous experience or engagement with manipulatives.

Assessment is an on-going exercise performed by both teachers and learners as they reflect on the content and nature of their activities; it also involves evaluating the individual or group thinking of learners, constraints in the questions posed and the viability of processes that are used to produce products or solutions. The active engagement of learners in the learning process is sometimes influenced by the technology that is available for their use.

Pre-service teachers implementation of the required reforms, requires a robust teacher education programme that enables them to integrate instruction, assessment and technology. In addition to the reform expectations, pre-service teachers need deep understanding of mathematical knowledge to enable them to be flexible in diagnosing the thinking of learners and to identify the misconceptions that learners may have in order to (re) direct and offer scaffolding for them with essential concepts that may be lacking. Educating pre-service teachers to implement reform expectations is a problem faced by teacher educators world-wide. Sytsma (2006) noted that it was not easy to inculcate for pre-service teachers a range of productive pedagogies in the following 4 areas in order to improve learning outcomes intellectual quality, connectedness of mathematical concepts, creating supportive learning environments and recognition of individual differences among learners. The inculcation is difficult to achieve because there seems to exist a gap between pedagogical theories advocated in teacher education programmes and the multifaceted classroom contexts in which pre-service teachers practice teaching. This gap between theory and practice is widely acknowledged as reported by Korthagen and Wubbels (2001) that many studies in teacher education show that student teachers do not use much of the theory taught in teacher education.

The gap between theory and practice is anticipated to be wider in the Open and Distance Learning (ODL) mode of teacher education, where pre-service teachers receive reading materials and have to work out for themselves what kind of teaching environments they are expected to implement. The wider gap in ODL arises because pedagogical theories that are studied by pre-service teachers in the absence of a teacher or educator modeling the classroom routines or activities may lack the depth required for novice teachers to enact the practice (Grossman *et al.*, 2009). Resolving pedagogical tensions that may occur in large and overcrowded mathematics classrooms are typical of South

African schools. It is also not easy for pre-service teachers who have not experienced face-to-face tuition with lecturers to find people they can emulate in order to enact the teaching of reform pedagogies. This defect can be a serious drawback for ODL-trained pre-service teachers once they start practising their profession, given that their teaching beliefs are heavily influenced by their experiences as students (Thompson, 1992) in both high school and teacher education programmes.

Educating effective mathematics teachers at a distance poses numerous challenges. The challenges arise from the complexity of teaching mathematics that looks deceptively simple (Grossman *et al.*, 2009). Teaching requires effective ways of dealing with the myriad of learning variables that learners bring to the mathematics classroom which make it impossible to replicate teaching methods from one class to the other or from 1 min to the next (Even, 2005). Reducing the complexity of teaching presented by these learning variables, requires pre-service teachers to choose resources wisely to pace content to match the cognitive levels of learners to create classroom environments that promote learner participation and to stretch learners cognitive abilities by posing questions that challenge and extend their thinking.

Some of the challenges faced by pre-service teachers include the failure to anchor constructivist pedagogies in a theoretical and practical frame work, in order to reduce the gap between theory and practice (Malone, 2000), the tendency of schools to allocate pre-service teachers overfull lesson loads to teach on their own and expect them to sink or swim (Shields *et al.*, 2003) and pre-service teachers own beliefs (Ernest, 1994). These problems sometimes result in pre-service teachers adhering to teaching practices that are different from the required ones because their instructional conceptions are not related in a linear way to their instructional decisions and behaviour (Thompson, 1984).

It was envisaged that a study analysing how ODL pre-service teachers implement pedagogical theories in their teaching, in general and mathematics education, in particular can be improved. Specifically, the debate on how to design the field experiences of ODL pre-service teachers may be informed by answers to the research question: What challenges influence ODL pre-service teachers to implement pedagogical theories in diverse classroom contexts during the teaching practice part of their programme? Designing pre-service teachers teaching practice experience, so that it will help to change their approach to teaching from the mere transmission of mathematical knowledge to a more

interactive constructivist approach, it was envisioned, would narrow the gap between theory and practice. The findings from this study would inform teacher education theory on how to reduce the disconnection between theoretical knowledge and teachers practical work in classrooms (Grossman *et al.*, 2009). Reduction of the theory-practice disconnection may provide pre-service teachers with insights that may enable them to change their instructional environment and culture and accomplish effective implementation of the constructivist learning methods that are advocated in their teacher education modules.

Context of the study: Unisa is one of the 10 largest international universities that offer degrees by means of Open Distance Learning (ODL). For the purposes of this study, only the bachelor of education (B.Ed) pre-service training of teachers to teach mathematics as a major or minor subject in the intermediate and senior phase (grades 4-9) is considered. As the term ODL implies, anyone who meets the enrolment criteria (passes in grade 12 are a pre-requisite) whether gainfully employed or not can study for this B.Ed programme, over a period of 4 years. Students who enrol for this programme study a minor and a major subject, as well as an additional indigenous language in order to make significant progress toward promoting equity among all learners who study mathematics in a second language, other than English or Afrikaans (Fiske and Ladd, 2004). The 11 indigenous languages characterise the South African rainbow nation in which English is generally the official medium of instruction, although some schools offer instruction in Afrikaans. During instruction teacher code-switching could be between English or Afrikaans and any 2 indigenous languages for instance, Zulu or Sotho. This is a strategy that is used to improve fairness and development and achieve equal access to education by all learners irrespective of their gender, race, religion and any disabilities, through high-quality instruction and any supportive services that any learners may need in order to benefit fully from the education system.

Pre-service teachers go for school attachment of 25 weeks during each of the 4 academic years of the B.Ed programme. The national policy framework for teacher education and development in South Africa makes provision for close collaboration between provincial education departments and universities to ensure appropriate placement and training of student teachers with the support of teacher mentors in schools. The Higher Education Quality Committee (HEQC) requires purposeful and effective mentoring and supervision of pre-service teachers in order to promote

professionalism by advocating well-planned guidelines and well-supported opportunities for school-based learning. To meet HEQC requirement, the university selects schools, after consultation with provincial education departments which are identified as appropriate places for teaching and learning where pre-service teachers can be deployed. While deployed to schools, pre-service teachers are expected to implement their theoretical knowledge and gain experience in local school contexts of the day-to-day instructional practice. The role of school-based mentor teachers is to guide and support pre-service teachers during their school attachment period by inducting them into teaching practice, providing them with opportunities to reflect on their own performance and helping them to achieve independence, self-reliance, self-confidence and eventually self-actualisation. Given the openness of ODL, the number of pre-service teachers on school attachment during any given semester and the widely dispersed geographical locations of the attachment schools, it is impossible to disregard disparities and train mentor teachers to provide uniform coaching at all schools. Furthermore, it is logistically impossible for university lecturers based in Pretoria to assess the classroom practices of all the pre-service teachers on school attachment.

The assessments of the classroom practice of the pre-service teachers on school attachment are made by district assessors, themselves specialists in the subjects that they assess. The district assessors are appointed and trained by the university. The classroom assessments are made on a uniform template that acts as a standardising instrument by which university lecturers regulate the assessments. The university expects supervisors to engage in professional partnerships with pre-service teachers and teacher mentors in order to enhance the pre-service teachers integration of theory and practice. By integrating theory and school attachment in the same academic year it is anticipated that the pre-service teachers may reduce their theory-practice gap. As the effort to reduce the theory-practice gap is maintained throughout the 4 years of the B.Ed programme, it is assumed that the pre-service teachers will develop an understanding of the role of theory and how to apply it in the real classroom by reflecting on the efficacy of their teaching strategies as demonstrated by how well their learners grasp the subject content.

Pre-service teachers learn to teach through their interaction with learners and content. This 3 fold instructional interaction between teacher, learner and content is not straight forward and is sometimes marked by problems. Some of these problems arise when pre-service teachers are attached to mentor teachers who are not conversant with the pedagogical practices that pre-service teachers are encouraged to implement. This

split between theory and practice arises from the assumptions held by some mentor teachers that pedagogical theories should be confined to university course work and that practical teaching is the exclusive domain of schools (Grossman *et al.*, 2009). Failure to resolve this and other problems that pre-service teachers sometimes encounter, may undermine innovations that are necessary to improve their teaching in ways that can delay progress made in the development of learning theories from instruction.

MATERIALS AND METHODS

The study took a qualitative research approach in the form of a case study where views of students registered for a teaching qualification were sought. A questionnaire was sent by post (using the official university mailing system) to 1 hundred pre-service mathematics teachers enrolled for the B.Ed degree. A return envelope was enclosed to enable the pre-service teachers to return completed questionnaires. The questionnaire was divided into 3 parts, namely biographical data, 5-point Likert items and open-ended questions. The biographical data sought to get information on the gender, matriculation symbol in mathematics, type of teaching practice school and grades taught. The 18 Likert items sought to elicit information on the professional assistance that the pre-service teachers received from their mentor teachers. The 3rd section was open-ended and gave respondents the unrestricted opportunity to express their opinions on their experiences during their teaching practice.

RESULTS

For the purposes of this study in terms of investigating problems that were experienced by distance education pre-service mathematics teachers during teaching practice the analysis of 2 questions in the third section of the questionnaire are reported. The 2 items focused on the content delivery aspects of their teaching practice that were problematical (D2) and problems with classroom management that they experienced during teaching practice (D5). Responses were received from 55% of the pre-service teachers on these 2 focal issues which provided rich primary data of the instructional challenges that they encountered.

Pre-service teachers who returned the completed questionnaires did so voluntarily. For ethical reasons, the preamble of the questionnaire made it clear that the responses received were to be used for educational purposes only and the names of the respondents whose responses were to be used to generate themes and conclusions in this study would not be disclosed. The pre-service teachers responses are only identified by a number that was assigned to the questionnaires at the

time they were received. The numbers were assigned to questionnaires numerically without association with the names of the respondents. These numbers were assigned for the purpose of referring back to the raw data during inter-rater validation of the themes.

The results presented in this study are based on the data analysis of all returned questionnaires. The biographical data on the questionnaire showed that the pre-service teachers taught classes varying from grades 5-10. The 8 themes, namely; classroom management, learners negative attitudes, handling large classes, learners poor communication, lack of skills on learner assessment, interruptions of the teaching routine, lack of mentor guidance, sensitivity to learner understanding and passivity, emerged from the data. Each of these themes is briefly discussed.

Findings: Content analysis involving analytic induction was used to interpret the written narratives of the pre-service teachers in the questionnaires (Bogdan and Biklen, 1998). The narrative texts were coded to develop themes that could be interpreted from the data (Creswell, 2008). Verbatim transcripts of responses are provided under each theme generated from the data followed by the interpretation researchers inferred.

Although, it was desirable that the respondents should be interviewed to further probe their responses on the questionnaire, the need for anonymity made it impossible to match questionnaire responses to the names of respondents. The lack of validating interviews to elucidate responses to the questionnaire is a serious limitation of the present study.

Learners negative attitudes: Some pre-service teachers experienced problems with learners poor attitude to mathematics classes. The problems they faced are summarised in the quotes:

Some learners were just difficult in that they never wrote home work assigned to them. Without evidence of written home work it was difficult to determine their understanding (Pre-service Teacher 9). At times I would find learners standing outside the classroom. I struggled to instruct them to get into the classroom. On Fridays or last period of the day it was difficult to manage and teach the learners. They had no concentration at all (Pre-service teacher 17)

In the quotes the learners poor attitude is manifested by their unwillingness to do homework and loitering outside the classroom at the beginning of mathematics lessons.

Classroom management: Classroom management was a serious problem faced by a majority of the pre-service teachers. A sample of the responses to the questionnaire is presented as:

When I started my teaching practice most of the learners were making noise during my lessons. I did not know how to get the learners to keep quiet in order to get their attention. I did not know how to let them listen or how to maintain silence (Pre-service teacher 30)

Learners at the school were not disciplined. My problem was how to discipline learners who had disruptive, unruly and truant behaviour, especially grade 9 learners. They were noisy (Pre-service teacher 36)

I was challenged by disciplinary problems of some learners. They would sometimes do actions in class to disturb the progress of a lesson. This would result in the whole class losing focus on what researchers were doing. Disciplining today's troublesome learners is hard and the law does not allow us to beat them (Pre-service teacher 15)

The earlier quotes show problems arising from noisy and disruptive learner behaviour. When faced with these problems, the pre-service teachers could not easily find effective ways of handling them because any action that can be interpreted as verbal and physical abuse is not allowed by law.

Handling large classes: Handling large classes was a common problem experienced by the pre-service teachers in this study. Some of the most serious problems experienced are apparent from these quotes:

The number of learners in each class was too large. It was difficult to give adequate attention to each learner in a crowded classroom. Some learners could make noise or even fight. The timetabling was ill-timed. It was difficult to work with mathematics learners during the last periods of a day (Pre-service teacher 27)

I had problems in managing resources for a relatively big class. The grade 8 classroom was over crowded and noisy. There was no space in the classroom to walk around to have personal conducts with the learners. As a result it was a bit difficult to achieve effective teaching and learning (Pre-service teacher 22)

The challenges arising from large classes that some pre-service teachers experienced were that learners were unnecessarily noisy and that pre-service teachers were unable to interact effectively with learners in order to monitor their understanding.

Poor communication by learners: Learners poor communication was a challenge that some pre-service teachers faced during their teaching practice:

The learners were poor to communicate in English. They lacked speaking skills especially when doing presentation of group activities. This challenged me because most of the learners were shy to express themselves (Pre-service Teacher 38)

From this quote researchers can infer that poor communication skills in English were a barrier that caused some learners to be shy to express their views in the mathematics classroom.

Lack of the necessary skills to deal with learner assessment: Assessment of learners work was a challenge that was faced by some pre-service teachers as described in the quote as:

The 1 of my greatest challenges was with assessment. I could not give learners enough written work for practice since the learners were too many. Mathematics was not the only leaning area I had to plan lessons for, mark scripts and control workbooks. It was not easy to mark their scripts since learners work was not neat. There was also a lot of administrative study work which included lesson planning and marking (Pre-service Teacher 34)

Researchers can infer from this quote that the pre-service teacher was overwhelmed by a range of difficulties arising from having to plan for too many lessons in different learning areas and marking the written work of learners in large classes.

Interruptions of the teaching routine: At times interruptions by other teachers making announcements while pre-service teachers were busy teaching lessons or the cancellation of lessons, created problems, as noted in the quotes as:

Certain teachers made my teaching difficult as they interrupted the lessons I was teaching. The disturbances influenced learners attention and the flow of a lesson (Pre-service Teacher 43) I was frustrated by preparing for lessons which sometimes were not taught due to numerous school disturbances (Pre-service teacher 33)

From these quotations researchers can infer that some pre-service teachers experienced problems in re-engaging learners after disruptions by other teachers who came into the classroom to make announcements while a lesson was in progress. Cancellation of some planned lessons owing to unanticipated changes to the school programme disturbed the equanimity of some pre-service teachers.

Lack of mentor guidance: Without the guidance of mentor teachers, some pre-service teachers faced challenges in handling lessons as depicted in the following quotes:

The school had no teaching and learning resources and there was no-one to turn to for help. Without teaching and learning resources it became difficult for me to implement learner-centered pedagogical methods. I had to use the transmission methods of drill and practice hoping that the learners will master the procedures that were covered in a lesson (Pre-service Teacher 4)

My mentor teacher never sat in the lessons that I taught in order to give me feedback on what I was doing well or not. She seemed to take me, as a relief teacher who took over her teaching load (Pre-service Teacher 8)

My mentor was very critical and I felt that I hardly did anything that pleased her. I had to stick to the textbook. Most educators are stuck in a groove and they are unwilling to accept change or question their teaching methods. I was frustrated because I could not implement the student-centered methods that I learned in my course (Pre-service Teacher 20)

These quotes show the 2 extremes of mentor teachers influence on pre-service teachers. On the one hand, some mentor teachers may be unavailable to show pre-service teachers where to get teaching resources and advise them on their teaching strengths and weaknesses. On the other hand, some mentor teachers may be so critical that they never notice any good professional attributes in the work of pre-service teachers attached to them.

Sensitivity to learner understanding and learner passivity: Some pre-service teachers were very sensitive to limitations in learner understanding and learners passivity, yet they were hampered in their efforts to overcome these limitations by the prevailing classroom atmospheres as shown in the quotes as:

When I was teaching the content the learners failed to grasp it easily. There were some learners in my class who took longer to understand some mathematical concepts than others. I had some learners with real learning difficulties in my grade 10 class. I gave them more attention yet it remained a challenge (Pre-service teacher 12)

I was worried if the learners understood the way I explained concepts to them. I was also worried that they might be afraid to ask questions. I was frustrated when the learners failed to solve the problems I gave them and yet they never asked questions or clarifications on aspects they did not understand (Pre-service teacher 3)

Lesson planning was not useful because when I asked the learners a few questions in order to determine their prior knowledge they could not answer them. In that case I had to deviate from my planned work to teaching the essential concepts which I anticipated were missing in the learners. This was necessary because mathematical concepts are cumulative, so that failure to grasp baseline concepts will result in failure to understand higher order ones (Pre-service teacher 5)

From the earlier quotes researchers may conclude that intellectual differences among learners, learner's passivity, problems with instructional explanations and gaps in learners' knowledge, created problems for some pre-service teachers in the presentation of the concepts covered in the lessons they taught.

DISCUSSION

The themes of classroom management, learners negative attitudes, problems associated with handling large classes, learners poor communication skills, lack of the necessary skills to deal with learner assessment, interruptions of the teaching routine, lack of mentor guidance and sensitivity to learner understanding and passivity that emerged from this study are fundamental to the teacher education of pre-service teachers who are encouraged to implement inquiry-based mathematics. Richards (1991) identified 2 different domains of mathematical discourse in the classroom. The inquiry discourse involves asking mathematical questions, solving non-routine or novel mathematical problems, making and proving conjectures, as well as listening to mathematical arguments. School mathematics, on the other hand, involves rules and algorithms which lead to number talk that is driven by computations. Researchers

argue that both inquiry-based methods and school mathematics are important for the acquisition of conceptual and procedural fluency by learners but advocate that learners should be involved in inquiry mathematics first to develop their ability to make sense of the subject, before they are encouraged to regurgitate rules and algorithms. It is of paramount importance to create a classroom atmosphere which is conducive to inquiry mathematics and 1 which will encourage learners to become engaged in genuine mathematical discussions amongst themselves and with the teacher (Yackel, 2004).

Classroom management was a challenge that was faced by many pre-service teachers in the study (Pre-service teachers 15, 30 and 36). One of the problems that these pre-service teachers faced, was to discipline trouble some learners (Pre-service Teacher 15). Teachers in South Africa are not allowed by law to use corporal punishment and some pre-service teachers felt that they had to stand by helplessly, watching the disruptive, unruly and truant behavior of learners (Pre-service teacher 36). These findings concur with those of Ives (2000) and Mason (1997) who reported that classroom management was a challenge for pre-service teachers particularly in urban areas and large classes. Distractions in such classrooms involve learners talking, fighting or moving about in an uncontrolled manner. With some experienced teachers also encountering a challenge when it comes to handling such disruptions the problem is even tougher for pre-service teachers. McDaniel and Kappan (1986) noted that teachers need to handle disruptive learners carefully because being confrontational with the latter may not be effective when they know that the teacher cannot use corporal punishment. In order to avoid specifically drawing the attention of other learners to the disruptive learner, a teacher can use the so-called name-dropping strategy (McDaniel and Kappan, 1986). The strategy entails a teacher simply mentioning the name of a disruptive or off-task learner in a natural dialogue. For instance when John is found talking to Mary, the teacher may say you see, John when finding the highest common factor of 2 numbers, researchers express the numbers in their prime factors. Mary, what are the prime factors of 36? Naturally when their names are mentioned politely by a teacher, learners can stop whatever they were doing and pay attention. When learners understand this type of classroom management, they may avoid disruptive behaviour because they fear that when they draw attention to themselves they might be asked a question that they may fail to answer. This could expose them to ridicule by other learners.

Name dropping as a form of classroom management, however is difficult to implement in a large class where a

teacher may not know learners names well enough. In a large classroom, pre-service teachers find it difficult to give adequate attention to each learner (Pre-service teacher 27) and learners exploit this weakness to become disruptive. A possible reason for learners in a large class to be disruptive is a feeling that a teacher is not selecting tasks and setting a pace of learning which take into account the differences in ability. The results also support those of Santamaria (2009) with regard to the differentiation in teaching and learning. Santamaria (2009) acknowledged that learner differences in terms of background knowledge, readiness, language, learning style and interest results in individually responsive teaching that is appropriate to particular learner needs. As it should be obvious from the numerous learning variables that need to be catered for in order to meet individual learners needs, differentiation is difficult to achieve in a mixed-ability classroom, particularly by pre-service teachers. For instance, Pre-service teacher 12 said that I had some learners with real learning difficulties in my grade 10 class. I gave them more attention yet it remained a challenge. The challenge arose from the average and the above-average learners who felt neglected when the pre-service teacher was giving individualised attention to learners at risk (Farren, 2008).

Teaching style can also be a source of classroom management problems. If a pre-service teacher fails to reach every learner in a class, the learners can become so bored, uninterested and restless that they can become difficult to control. The experience of Pre-service teacher 11 illustrates the behaviour of bored and restless learners:

The classroom arrangement is was absurd. Slow learners were seated at the back and bright ones in front. The slow learners should be placed in front so that I could closely monitor their understanding or probe their knowledge gaps in efforts to minimise the misconceptions that they may hold. The idea of grouping slow learners at the back of the classroom strained me. Whilst the principle of having bright learners sit in front was the strain of moving up and down the classroom without giving due attention to the bright learners. For instance, the noise from the back of the classroom was sometimes irritating and disruptive. When I got to the back of the classroom, the learners kept quiet and when I returned to the board to illustrate some examples the learners made noise. If they were close to the black board they could feel my presence and refrain from making noise (Pre-service teacher 11)

Barry and King (2010) suggest that minimising inappropriate behavior in class could be done through planning, careful organisation of learners in time, material and space, establishing and maintaining rules, routines and procedures and maintaining positive relationships with learners. To respond to inappropriate behavior, Barry and King suggest that pre-service teachers should carefully observe how a mentor handles a class, thoughtfully analyse the cause of the inappropriate behavior and select and use appropriate management techniques.

The attitudes of learners to mathematics can contribute to their misbehaviour in class. Attitudes are learners personal ideas and imaginations, their idiosyncratic temperament, inclinations or frame of mind with regard to mathematics as a subject and to mathematics teachers. Learners negative attitudes are shaped by encountering many years of frustration and lack of success in their classrooms (Farren, 2008). Due to their frustrations and lack of learning success, learners with negative attitudes to mathematics feel that the subject is hard and meaningless and they attend lessons without interest or with some degree of resistance. Learners resistance or lack of interest are manifested by not doing class-work (Pre-service teacher 28) or standing outside the classroom when a mathematics lesson is about to begin and a teacher has to struggle to instruct them to get into the classroom (Pre-service teacher 17). When they finally get into the classroom, such learners may develop unconstructive relationships with their teachers and it may become difficult to engage them in meaningful mathematical activities (Farren, 2008).

Poor communication in the mathematics classroom may exacerbate some learners poor attitudes to mathematics. When they fail to communicate their mathematical ideas, some learners may feel inadequate and may be misjudged as weak learners to such an extent that they withdraw from participation in class discussions (Farren, 2008). A strategy that pre-service teachers can use to involve learners full participation in the mathematics classroom and improve their attitudes towards the subject is to engage them in group activities. Group work is an example of a learner-centred teaching approach that encourages learner-active construction of mathematical concepts and relationships with assistance from peers. Creating mixed-ability groups enables less able members to be helped and supported by more motivated learners to complete the group tasks (Spinner and Fraser, 2005). Learning mathematics in groups has several advantages over individual learning. It can offer learners opportunities to communicate their intuitive knowledge, using a language that they have in common, thus reducing communication barriers and shyness.

Group-work can help to reduce resource limitations, for instance because a group can share one text book (Spiller, 2010). Lack of resources, however is so common in many schools, such that pre-service teachers are hampered in their pedagogical activities. With the help of their mentor teachers, if available pre-service teachers could acquire the craft knowledge of how to improvise and make use of available technology in order to overcome shortages of more advanced teaching resources. Craft knowledge, as described by Brown and McIntyre (1988) is that part of their knowledge which teachers acquire primarily through practical experience in the classroom which is for the most time not articulated in words. However, some pre-service teachers had no-one to turn to for help (Pre-service teacher 4) and others had mentor teachers who never sat in on the lessons that they were teaching in order to provide feedback on professional aspects: To tell them whether they were doing well or needed to improve in certain areas (Pre-service teacher 8). Mentors unavailability to help pre-service teachers is not a finding peculiar to the present study. Elsewhere in Botswana (Monyatsi and Nleya, 2004) and Zimbabwe (Mavhunga, 2004), mentors were reported to be of not much assistance to pre-service teachers when available or were completely unavailable. Without assistance from mentors, some pre-service teachers can merely cope with the day-to-day classroom practices, inclusive of teaching well.

CONCLUSION

Researchers are of the view that the problems that were faced by pre-service teachers in this study, as captured in the 8 themes already discussed above need to be brought under control. This can be done by ensuring that pre-service mathematics teachers engage in the task of integrating pedagogical theories in their teaching practice with their activities in diverse classroom situations. Teaching practice provides pre-service teachers with an ideal opportunity to develop skills in handling these challenges in a supportive and facilitative atmosphere (Barry and King, 2010).

Evidence from this study shows that there should be greater effort to improve cooperation between the university and schools if there is to be genuine progress in assisting pre-service teachers to overcome the problems researchers have identified and reduce the gap between theory and practice with the assistance of mentor teachers. The findings of this study are not unique to ODL pre-service teachers but can be applied to any pre-service teacher on school attachment, thus the results of the present study can be generalised to include

pre-service teachers in formal and face-to-face tuition situation. The limitation of the present study arises from not conducting interviews with the pre-service teachers in order to probe and verify their responses to all the open-ended questions, in order to establish the impact of the challenges on their teaching practice. It would be worth while in future research to do follow-up interviews with mentors and pre-service teachers, in order to improve the insight into the challenging instructional experiences reported in this study.

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