The place and role of effective classroom management in the improvement of Mathematics education in Gauteng province

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The place and role of effective classroom management in the improvement of Mathematics education in Gauteng province

by

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DECLARATION

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I, Abigail Juta, declares that this study titled: *The place and role of effective classroom management in the improvement of Mathematics education in Gauteng province* is my own work. This thesis has never been submitted for any degree at any other university. Hence, this is my own work in design, execution and all sources utilised in this study have been indicated and duly acknowledged by means of direct and indirect references.

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ABIGAIL JUTA **DATE**

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ABSTRACT

This study explores the feelings, perceptions and experiences of Mathematics educators as they use classroom management to improve Mathematics education in the sampled four secondary schools in the Gauteng province. The main research question was to understand the place and role of effective classroom management in the improvement of mathematics education. In answering this question, the researcher collected data through purposively and conveniently selected four schools in Gauteng province. The researcher engaged the Mathematics head of department and Mathematics educators of participating schools to conduct face-to-face semi-structured interviews with heads of departments, and focus group discussions with Mathematics educators. Data was also collected through limited observation of different administrative aspects in Mathematics classrooms. Data collected was thematically analysed. The data analysis resulted in four main themes emerging. Overall, it was identified that Mathematics educators are expected to perform multiple tasks which necessitate good classroom management skills thereby enhancing an improvement in the performance of learners. From the data obtained, analysed and discussed, the study established that good Mathematics teaching cannot be separated from effectively managing classes, and that effective classroom management is a necessity in Gauteng province. Several elements which enhance effective classroom management were found to be, possession of relevant and adequate resources in the form of material and physical or material, educator professional skills and characteristics, parental and school management support as well as positive learner participation. it was seen that educators were facing several challenges which interfere with their efforts to restore and maintain an organised teaching–learning environment.

KEY TERMS

Classroom management
Improvement in Mathematics education
Effective classroom management
Place and role
Educator

Education system

Teaching and learning

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LIST OF ABBREVIATIONS

ATP ..... Annual Teaching Plan
CAPS ..... Curriculum Assessment Policy Statement
DBE ..... Department of Basic Education
FET ..... Further Education and Training
FGA ..... Focus Group (School A)
FGB ..... Focus Group (School B)
FGC ..... Focus Group (School C)
FGD ..... Focus Group (School D)
GET ..... General Education and Training
HOD ..... Head of Department
HA ..... HOD (School A)
HB ..... HOD (School B)
HC ..... HOD (School C)
HD ..... HOD (School D)
SACMEQ-III ..... Southern and East African Consortium for Monitoring Education Quality
TIMSS----------Trends in International Mathematics and Science Study
WEF..... World Economic Forum

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CHAPTER 1

ORIENTATION

1.1 INTRODUCTION

Mathematics is a vital subject to master in any society. Various studies in Mathematics have indicated that ineffective classroom management is a major contributory factor to the poor performance. (Unal & Unal 2014; Mbugua, Kibet, Muthaa & Nkonke 2012; Mizar & Iqbal 2014; Van Der Berg & Louw 2006; Spaull 2013). This study is an exploration of the role played by classroom management towards the improvement of Mathematics education. Chapter one comprises a background to the research study, statements of the problem, aim, objectives, and significance of the study, limitations and an introduction to the research design and methodology which was utilised.

1.2 BACKGROUND

Graven, (2014, p.7) indicated an analysis of numeracy ranking in which South Africa scored 30,2% which is half of the best African country Tunisia with a score of 60,4% in The African Monitoring Learning Achievement. The findings relate to studies long ago in which Howie (2003, p. 1) highlighted that, the South African educational situation was earmarked by significant poor-quality Mathematics results as measured by the Trends in International Mathematics and Science Study (TIMSS). It was established that the majority of South African learners are not performing well in Mathematics as evidenced in the survey conducted by the Southern and East African Consortium for Monitoring Education Quality (SACMEQ III 2007) that focused on the learning and performance of Mathematics learners. The notion is supported by Van Der Berg (2007) who found out that South Africa had performed below most other African countries taking part in his study on "The South African Economic Policy under Democracy: A 10-year review" It was further established that an alarmingly high proportion of learners in the survey had not mastered even the most basic reading and numeracy skills. Furthermore, another writer, Shabalala (2005) identified that of the 15 African countries that participated in SACMEQ

III, South Africa was perceived as having the third highest proportion of functionally illiterate learners (27%), as well as being the fifth country with the highest proportion of functionally innumerate learners (40%).

The importance of Mathematics as a subject can be justified by pointing to applicable programmes of reform in emerging progressive school systems. This notion suggests that education is regarded as an ultimate component of human life. Similarly, most if not all African states, upon the attainment of independence, declared that their primary goal was improving the education system.

The improvement of Mathematics education can be seen as one of the objectives of an education system. This notion is supported by Mbugua et al. (2012) who propound that Mathematics is perceived by society as the foundation of scientific and technological knowledge which is very important in the socio-economic development of a nation. This further qualifies Mathematics as a key subject in which a good pass rate is a fundamental element of every society.

South Africa is no exception to the educational concerns mentioned in the previous paragraph. There has been a transition by the Department of Basic Education (DBE) in curriculum formulation, from a National Curriculum Statement to a National Curriculum and Assessment Policy Statement, which is evidence of an attempt to improve academic learning, specifically in subject-teaching. (DBE, 2011).

The details presented in the previous paragraphs point towards concerns on the teaching of Mathematics education in South Africa. Hoadley (2007) added that the increasingly poor performance of South African learners in Mathematics suggests there is a prerequisite for adapting related interventions other than curriculum vagaries in the nation's classrooms. It is vital to note that in South Africa, Mathematics is compulsory up to grade 9. From grade 10, learners have a choice of taking either Mathematics or Mathematical literacy. The choice of subjects at Secondary school is associated with various challenges such as failure to seek or access the information which is necessary for such rational decision-making of subject choice. (Warton & Cooney 1997). As such, incorrect subject choice results in learners struggling to cope and at times making it difficult for Mathematics educators to create or maintain a positive climate for effective classroom management. The situation necessitates the exploration

of all possible avenues to find a way to improve Mathematics education at national level than changing curricula. In section 1.3 this aspect is further illuminated by referring to research studies that emphasise challenges regarding Mathematics education in South Africa. The angle of this investigation however is placed on improved classroom management as part of a solution to the continued underperformance in Mathematics.

1.3 STATEMENT OF THE PROBLEM AND RESEARCH QUESTIONS

1.3.1 Statement of the problem

Globally the question on how to teach Mathematics more effectively has been persisting during the first part of the 21st century. Studies with the focus on the impact of language, teacher development, teacher efficacy and the integration of the curriculum documentation in improving Mathematics teaching, were conducted by various authors (Muchena & Moalisi, 2018; Umugiraneza, Bansilal & North, 2018; Essien, 2018; Du Preez, 2018). The foci of the mentioned studies are remarkably similar to those of Adler, Alshwaikh, Essack and Gcsamba (2016) who reported on research in Mathematics education in South Africa between 2007-2015. They (Adler et al. 2016, p.2) identified "(a) curriculum reform and implementation with focus on relevance in mathematics and learner centred practices; (b) teacher education with a focus on mathematical knowledge for teaching and teacher learning; and (c) learning and teaching in multilingual classrooms", as key areas investigated during the 8-year period. Despite the emphases on various aspects of teaching in mathematics it is evident that the state of mathematics education in South Africa is not on par with other counties. In an influential report on global competitiveness (World Economic Forum, 2017) South Africa is only ranked 128th of 137 countries in terms of its eminence in Mathematics and Science education. Bosman and Schulze (2018) imply that the increasingly poor performance of South African learners in Mathematics suggests there is a prerequisite for adapting related interventions other than teaching and curriculum matters in the nation's classrooms. The situation sketched necessitates the exploration of other possible avenues to find a way to improve Mathematics education. Effective classroom management is one such plausible solution.

. The main research problem thus emanated from the fact that there is underperformance in Mathematics as a subject.

The main problem of the study was therefore formulated as the following research question: What is the role and place of effective classroom management in Mathematics classrooms?

1.3.2 Research questions

This research study is based on secondary questions formulated within the scope of the main question which is stated above. The following secondary research questions are:

1. What are the challenges faced by educators in Mathematics classroom settings?
2. What are the functions of classroom management in Mathematics classrooms?
3. Which classroom managerial skills can be applied to enhance better performance in Mathematics?
4. Is educators' knowledge sufficient to provide and manage in Mathematical instruction?
5. Which elements should be included in a model for effective classroom management? ?

1.4 AIMS AND OBJECTIVES OF THE STUDY

In this subsection, the aims and objectives of the research study are discussed.

1.4.1 Aim

The aim of this study is to understand the place and role of effective classroom management in the improvement of Mathematics education, drawing from the perspectives of teachers and literature.

1.4.2 Objectives

The research study is made up of the following objectives:

1 To identify the challenges faced by educators in Mathematics classroom settings.
2 To determine the functions of Classroom Management in Mathematics classrooms.
3 To establish which classroom managerial skills can be applied to enhance performance in Mathematics classrooms.
4 To determine if educators' knowledge is sufficient to manage Mathematics classrooms
5 To establish which elements should be included in a model for effective classroom management in Mathematics.

1.5 SIGNIFICANCE OF STUDY

Various scholars have validated the notion that Mathematics is an essential learning subject and a universal language or form of intelligence on its own for developing and reconnoitring mathematical structures. Mathematics as a vital core subject is regarded as the basis of future engineers, doctors, technicians, accountants and even entrepreneurs (Hoadley 2007). There is, therefore, a pressing need to focus on the development and improvement of school achievement in Mathematics education.

The present research motivates educators in teaching the subject area, by shedding light on better Mathematics classroom management. This study benefits the educator participants and responsible authorities in sound decision-making, thereby enhancing effective Mathematics education as well as quality academic performance. The research study outcomes have the potential of adding value and forming part of existing knowledge systems that can be utilised by educational planners and implementers in improving Mathematics education.

In addition, the study serves as a theoretical knowledge base for responsible authorities to effectively monitor, supervise, and evaluate the overall Mathematics classroom management. Suggestions have emanated from the study, for instance, the introduction of computer laboratories or electric boards as well as the engagement of assistant educators. Such suggestions may serve as possible areas to conduct future research. These suggestions serve as a knowledge base that could also be extrapolated not only in Mathematics education but to other academic components or subject areas.

1.6 RESEARCH DESIGN AND METHODOLOGY

1.6.1 Research approach and design

The researcher associated herself with the qualitative research approach, employing an exploratory research design on the effectiveness of classroom management in relation to Mathematics education. This research design aligns well with a qualitative approach and permitted the researcher to understand the place and role of effective classroom management in the improvement of Mathematics education, drawing from the perspectives of teachers and literature.

The researcher collected data in the natural settings of the participants, namely their respective schools. Hence the nature of the research study envisaged the researcher into utilising an exploratory research design, the researcher was conscious of the fact that research findings could not be

generalised to a larger population (Creswell 2011). It is necessary to note, once again, that the aim of this research study was to understand the perspective of educators on the place and role of effective classroom management in the improvement of Mathematics education specifically in Gauteng province.

The process began after the researcher obtained the required permission from the University of South Africa (UNISA) (see Appendix K). The researcher then sought permission to collect data from the Gauteng Department of Basic Education (DBE) and also from principals of participating schools. The researcher then opted for a non-probability sampling procedure in order to find the best participants for the research study.

1.6.2 Sampling procedure and data collection

Holloway and Wheeler (2002) assert that sample size does not influence the importance or quality of a qualitative study. They further alluded that there are no guidelines in determining sample size in qualitative research. Convenience and purposive sampling techniques were employed in the study, in accordance with Jacqueline and Barriors (2006) who point out that purposive sampling uses information-rich participants. As such, the sample was purposively selected, with every participant being a Mathematics educator or a Mathematics head of department with the assumption that schools employ only qualified educators. The following considerations were taken into account when selecting participants:

1. Participants were from four selected schools in Gauteng province
2. The participants were Mathematics educators and Mathematics HODs of the selected schools regardless of gender, age, qualification or experience.
3 The participants were to be free, willing and readily available to participate in the research.

A participant information sheet was prepared and explained to participants in order to understand the data collection process. Participant information for the HODs is shown as Appendix C, while the relevant information for the focus group participants is Appendix D. As noted, to

save time while minimising financial travelling costs, the researcher conveniently chose to utilise schools in Gauteng province which were in close proximity to the researcher.

Data was successfully collected from twenty-three participants from the four selected high schools in Gauteng province (one participant did not attend the scheduled interview). Participants were five Mathematics educators per school for the focus group discussions and the Mathematics HODs for the individual interviews. Participants' responses were vital in addressing the main research question. Face-to-face semi-structured interviews, focus group discussions, and observations were the instruments utilised to collect data.

Observations were carried out simultaneously during the interview and focus group discussions. An observation guide was prepared (see Appendix H). The researcher carefully observed the classroom appearance, displays, seating arrangements, the dressing of educators and the nature of communicating during a focus group discussion which was carried out in one of the Mathematics classrooms. In order to capture every detail, all interviews and focus group discussions were audio-recorded. Ethical matters were considered throughout the research process. Participants had to sign a consent form before data was collected (see Appendix E). In order to form structure and meaning from the research findings, the data collected was transcribed and then thematically analysed.

1.6.3 Data analysis and interpretation

Data analysis and interpretation was carefully carried out in order to organise research findings and make reasonable conclusions on the place and role of effective classroom management in the improvement of Mathematics education. The researcher had to utilise thematic analysis by following the six steps recommended by Creswell (2009) namely step 1: Familiarising with the data, Step 2: Generating initial codes, Step 3: Searching for themes, Step 4: Reviewing themes, Step 5: Defining themes, Step 6: Write up. The researcher familiarised herself with the collected data from the interviews, focus group discussions and observations. Furthermore, the researcher had to repeatedly refer to the recordings and notes in order to maximise familiarisation with the collected data.

Familiarisation with collected data assisted the researcher in determining codes which made sense by organising them into categories that cut across all of the data sources. The identified codes were also labelled then divided into various categories which made sub-themes (Creswell 2011; Nieuwenhuis 2010). The researcher carefully related the sub-themes in order to establish the main theme needed for answering the main research question. In order to compliment and offset the weaknesses of data collection methods, the researcher employed crystallisation as recommended by Maree (2008). Crystallisation is the process that emerges from the various data gathering techniques and data analyses steps employed and represents the researcher's own reinterpreted understanding of the phenomenon classroom management in Mathematics.

1.7 RATIONAL AND MOTIVATION FOR STUDY

The researcher strongly believes that she can carry out this research study as she has been involved in management for twenty-five years. Besides being a Mathematics educator, the researcher had an opportunity to head the Mathematics department and the results improved unexpectedly by twenty percent which shows the effectiveness of the teaching strategies implemented**.** As a head of department, the researcher automatically qualified to be a member of the school management committee where all managerial decisions are discussed and approved to enable the smooth running of the school. Furthermore, the researcher was also a team leader in the marking of the national Ordinary level Mathematics Paper 1. In addition to marking papers I trained new markers as well as moderators. The researcher also assisted in briefing co-examiners on common errors and suggestions to improve Mathematics results. A combination of all these professional experiences, coupled with her academic qualification of a Master's Degree in Educational Administration, Planning and Policy Studies, made a significant contribution in motivating me to carry out this study.

In so far as this project is involved the researcher 'learned research' by completing the research proposal to the satisfaction of the relevant committee and by obtaining ethical clearance as required. The thesis was then written by following UNISA guidelines. More particularly the proposed steps of collecting and processing data were followed and the problem statement as well as the research aims and objectives clearly delineated. Samples of research questions, interview guide, focus group discussion guide as well as a guide on what was to be observed were

included as appendixes to the theses. This was followed by an application to the Gauteng Department of Education, indicating the research process and attaching the Clearance certificate from Unisa. The researcher was issued with a week permission to collect data as it could not be done in the fourth. During this short period the researcher managed to arrange focus group discussions and individual interviews. Earlier in 2018, the researcher had to request for an extension of permission to continue with data collection and this was immediately granted. The researcher then continued visiting schools requesting permission to collect data till finally managed to get all four schools as was approved in the proposal. Data collection was carried out exactly as was indicated in the approved proposal except that one HOD failed to attend the scheduled interview. The researcher could not get as many documents as expected due to the fact that most participants were hesitant to have their minutes of meetings, lesson plans which formed part of the limited observation.

All meetings were audio recorded. Recordings were transcribed. Transcriptions, a few documents which included the CAPS document, ATP and attached sample of classroom rules were used for the data analysis. Related responses were colour coded and this led to the four themes being established. Each theme had three sub themes which in total provided answers to the research question. In carrying out the research, the researcher was cautious of the fact that her experience as a Mathematics educator will not distort the objectivity needed in collecting or analysing the data. The data analysed was discussed in relation to the literature review. In the final chapter the researcher arrived at a conclusion based on the research questions. Recommendations, delimitations and limitations of the study, contributions of the study and proposed future studies based on limitations were given. The main question of the research was on perceptions of educators on the role of classroom management towards the improvement of Mathematics education.

1.8 RIGOUR OF STUDY

Thomas and Magilvy (2011) purport that rigour is a vital component for establishing consistency of study methods which provides an accurate representation of the population under study. To enhance credibility and trustworthiness of the research study, the researcher employed crystallisation. It was important to explore nuances in research findings, even when research findings were obtained on different occasions or by different collection methods. Findings were reported as discovered within the research process in order to correctly increase credibility while recognising the diversity and complexity of research participants as well as the research context. (Northcote 2012).

In conducting this research study, the researcher ensured that no harm would come to participants by securing safe venues. The participants were informed of procedures in detail and then signed consent forms to participate without being coerced. The researcher ensured that all participants were aware of their right to withdraw from the research study at any given point. Participants were accorded privacy and made aware of the potential benefits of participating in the research.

1.9 ETHICAL CONSIDERATIONS

According to Gray (2004, p. 235), participants should be informed of procedures and risks, given advice, and should freely give their consent to data collection procedure. In this research study, the researcher utilised a participant information sheet and informed consent form. The researcher handed out participant information sheets to all participants and also explained what it contained. The participants were accordingly informed of the purpose of taking part in the study. It was stressed that participation in the research study had no monetary benefits and that withdrawal from participation at any point during the data collection process was allowed.

Data collection was voluntary, harmless and involved non-sensitive issues. Some participants needed clarification on confidentiality and the researcher assisted without any challenge or hesitation. All data collected is stored at UNISA for five years. Participants were also informed that they would be informed about the research findings at a workshop before the study was finalised. Participants then signed the consent form after having understood its contents before any data was collected.

Participants also agreed to recording of proceedings during the interviews as well as focus group discussions to capture all deliberations.

1.10 DEFINITION OF CONCEPTS

Classroom management

According to Ersozlu1 and Cayci (2016, p. 144)

> "Classroom management is teacher's individual characteristics, the teaching strategies, methods and techniques which she/he uses while lecturing, his/her harmony with the social environment, the cooperation between school and family, physical conditions of the classroom, students' characteristics and requirements, the structure of the school, the rules adopted by the school and the atmosphere formed in the class".

Furthermore, Sahin (2015) describes classroom management as a process in which the positive attitude and behaviours of the educator and learner allow effective teaching and learning to be established and maintained or re-established if an unpredictable happening occurs. In this study, Classroom management is used to mean all organisational, planning, control and guiding kind of activities that Mathematics educators employ in their classrooms to enhance performance in Mathematics classrooms.

Improvement in Mathematics education

Improvement in Mathematics is described in this study as a contributory factor to the increase, upgrading or betterment of Mathematics education.

Effective classroom management

The researcher views effective classroom management as the active management practices of promoting wanted behaviour while simultaneously discouraging unwanted behaviour in Mathematics classrooms.

Place and role

In this study, the place and role refer to the part played by classroom management in enhancing improved performance in Mathematics.

Educator

An educator can be described as a Mathematics teacher, trained to teach Mathematics in secondary school in Gauteng Province or head of Mathematics department in the selected school.

Education system

In this study the education system is described as the public schooling system in South Africa.

Teaching and learning

In this study teaching and learning refers to all activities that take place in a classroom to enhance effective provision of instruction.

1.11 OUTLINE OF CHAPTERS

This thesis consists of five chapters, as outlined below:

Chapter 1: Background and overview of the study

This chapter provided an overview of the whole research that includes the introduction and background to the research study, statement of problem under study and research questions, significance of the study, delimitations and limitations as well as research design and methodology.

Chapter 2: Related literature review

In this chapter, the researcher deliberates over the literature relevant to the place and role of effective classroom management in Mathematics classrooms. The chapter discusses teaching in Mathematics classes, the classroom as a place of teaching and learning, classroom management as a contextual factor, classroom management styles, classroom management functions, components of classroom management as well as classroom administration.

Chapter 3: Research design and methodology

Details of the research methodology and design, ethical considerations and rigour of the study are discussed in this chapter.

Chapter 4: Data collection and analysis

The chapter provides a detailed discussion of the data collected, data representation and analysis of research findings in relation to the reviewed literature.

Chapter 5: Research summary and recommendations

The final chapter presents a summary of the research background, research significance, purpose, research limitations and related theories to effective classroom management for the improvement of Mathematics education. Recommendations based on research findings are highlighted.

1.12 CONCLUSION

In this chapter the background and introduction to the research study was provided. The research problem and research questions were stated, together with the aims and objectives of the study. A detailed account of the significance of the study were also done.

In the following chapter literature relating to effective classroom management for the improvement of Mathematics education were reviewed.

CHAPTER 2

LITERATURE REVIEW

2.1 INTRODUCTION

According to Leedy and Omrod (2014, p. 5) a literature study can be described as an investigation related to research that has already been done concerning one's own research questions. A literature review can also assist in adding value to the body of knowledge in the subject area. The specific reasons for conducting this literature review relate to the management of Mathematics classrooms with the focus on, investigating the management of teaching and learning in these classrooms. In this chapter the related literature, background and context of the study, the classroom as a place of teaching and learning and classroom management as a contextual factor are reviewed.

2.2 BACKGROUND AND CONTEXT

This section details the theoretical basis for the study. The three main sections, namely the organisation of Mathematics classrooms, the classroom as a place of teaching and learning, and classroom management contextual factors are discussed.

2.2.1 The organisation of Mathematics classrooms

The first aspect of the background and context of this literature review is the organisation of Mathematics in schools in general, and particularly in South African schools. Muller (2014) suggests that without studying Mathematics, it is challenging for an individual to develop intellectually or culturally. On the other hand, Biza, Nardi and Joel (2015) highlight the fact that educators tend to struggle as they attempt to balance mathematical challenge, sensitivity to students and management of learning. Related mathematical studies have been carried out, all with the general aim of

developing an improvement in Mathematics education. Earlier studies have shown that Mathematics education involve the organisation of teaching methods and curriculum implementation to assist learners in improving their reasoning skills as they find solutions to topics such as number patterns and constant differences, as guided by the Annual Teaching Plan (ATP). Hence, teaching in Mathematics classrooms is highly dependent on several factors such as the class size, the availability of resources, educator ability to employ professional skills, the nature of the topic, the objective to be achieved as well as the learner achievement level.

Poor performance in Mathematics may be a result of the common teaching methods currently practised in most countries including South Africa. In order to justify the previous point, an example is provided, in which the teacher-to-pupil ratio is emphasised as an element that impacts on learning (Mirza & Iqbal 2014). An educator can for instance be assigned to teach a large class of about 50 learners without a teaching assistant. In their pilot study on teacher-pupil ratios Molnar, Smith, Zahorik, Palmer, Halbach and Ehrle (1999) suggest 1:15 as a suitable ratio for a Mathematics or Science class. They (Molnar, et al. 1999) observe further that some schools have a 1: 30 ratios. However, this aspect must be researched further in South Africa to establish the ideal class size for effective Mathematics classes. A very high teacher-pupil ratio may result in learners emerging with feelings of mental lethargy and excessive enervation, facing challenges in staying focused or understanding what the Mathematics educator is explaining or demonstrating.

Levin, Hammer and Coffey (2009) observe that new teachers struggle to attend to their learners' ideas as they focus on classroom management and curriculum coverage. Greenberg, Putman and Walsh (2014) comment that classroom management challenges being faced by educators have been evident for decades, With recognition of bias component, it seems like a large teacher-to-pupil ratio, lack of understanding classroom management and imposed curriculum coverage can hinder educators in obtaining individuals' attention or class control and, in some cases, result in learners losing interest in Mathematics. It is therefore essential to understand the classroom as a place of teaching and learning, as discussed in the following section.

2.2.2 The Classroom as a place of teaching and learning

The second critical aspect of the context and background for this literature study is that a classroom should be viewed as more than just an environmental setting or place of learning associated with multiple activities (Graven 2016). The educator has a most important managerial responsibility for all learners allocated to specific classrooms where teaching and learning is expected to take place (Nieuwoudt 2015). A classroom is a unique and complex learning, social, and cultural environmental setting comprised of active communications between the educator and learners from diverse backgrounds for a common purpose (Grapragasem, Krishnan, Joshi & Azlin 2015). Valuable components of a classroom with its own settings, functionality, and dynamics can be a critical issue for management (Weinstein & Romano 2015). It is also known that a classroom in its physical aspect can provide emotional and physical security and shelter (Akın, Yıldırım & Goodwin 2016).

Mathematics educators have to take the factors mentioned in the previous paragraph into consideration when it comes to their classroom management (Grapragasem et al. 2015). Apart from ensuring that classrooms provide protection from harsh weather conditions such as extreme heat or cold, as well as from noise pollution and poisonous odours, Mathematics educators have the responsibility to ensure that the classroom is experienced as a place of emotional security with a good learning atmosphere so that classroom management does not interfere with Mathematics learning (Biza et al. 2015).

Research findings indicated that Mathematics educators are not allowed to choose specific classrooms but have to maintain the classroom allocated and ensure that a conducive learning environment is created. Mathematics educators do not have a wide choice of content to teach. Curricula, time-table requirements as well as teaching methodologies are to a degree imposed by responsible provincial authorities. Classroom activities include numerous tasks such as group activities, peer teaching or individual “spot-on-remedy” takes place. (Kruger and Van Schalkwyk 2016). Multiple activities may include the educator giving instructions, learners participating as a whole class, groups or as individuals, listening attentively, and at times not paying attention, the educator doing classwork, participating in evaluation procedures, keeping records, checking workbooks and being

involved in group discussions. This implies that for a classroom to be an effective unit of management, it is obligatory for the educator to take cognisance of the environment, of availability of resources, and of values, needs and interpersonal relationships (Stols, Ono & Rogan 2015).

2.2.3 Classroom management as contextual factor

Classroom management is a challenge for most educators. The fact that maintaining desirable behaviour and preventing behaviour not desired is also part of this setup, makes it even more complex (Etuk, Afangideh & Uya 2013). A brilliantly crafted lesson may end up being ruined if undesirable behaviour is not well managed (Greenberg, Putman & Walsh 2014). Allen (2010) views classroom management primarily as discipline and management of student misbehaviour. Classroom management in Mathematics takes into account all the educator efforts to enhance a conducive environment for the successful implementation of the curriculum as guided by the ATP.

Akin et al. (2016, p. 784) highlight disciplinary attitude of school administrators, their communication styles with learners as well as parents, their lack of collaboration with educators, the inconsistency between school and class atmosphere, and negative school environment along with lack of rules and encouraging practices, as the factors leading to classroom management problems. Greenberg et al. (2014) advise that undesirable behaviour may include learners fighting physically or verbally, use of improper language, singing, chatting or playing games on cell phones, imitating or making irrelevant comments.

Seiz et al. (2015) indicate that effective classroom management is a challenging process for educators which can be utilised by employed by educators to improve their classroom organisation and planning. Effective classroom management is also seen by Marquez, Vincent, Marquez, Pennefather, Smolkowski and Sprague (2016, p. 18) as a key predictor of student success. Marques et al. (2016) make the point that it is also classroom management which reduces teacher stress and burnout. Akin et al. (2016) agree that classroom management, if not well carried out, can lead to job dissatisfaction, teacher burnout and stress to both the educator and learner.

Mathematics educators are expected to possess skills that will contribute to effective classroom management. In relation to this idea, Sieberer-Nagler (2016:164), propounds that;

> Effective classroom management and positive classroom climate construction are essential goals for all teachers. Everything a teacher does has implications for classroom management, including creating the setting, decorating the room, arranging the chairs, speaking to children and handling their responses, putting routines in place (and then executing, modifying, and reinstituting them), developing rules, and communicating those rules to the learners".

Learners' achievement probably only improves if educators have sound knowledge of content and sufficient skills to convey key aspects of knowledge to them (Spaull 2013). In these classrooms, learners are motivated by educators applying sound assessment techniques and by showing understanding for their views (Ari, Tuncer & Demir 2016). It is clear therefore that the effective execution of these classroom management techniques should assist greatly in ensuring success of educative and teaching activities in the Mathematics classroom (Ersozlu1& Cayci 2016).

Having an effective classroom climate is another key aspect of the context and background to the study. This kind of climate is only possible when the educator values and has respect for individual differences (Unal & Unal 2012). It is true that a well-maintained, warm and friendly classroom environment will enhance positive interpersonal relationships necessary for academic improvement and goal achievement (Weinstein & Romano 2015). As such, Mathematics educators are expected to be knowledgeable and skilled in order to carry out classroom management activities which include establishing a sound classroom climate, handling conflict, managing available resources, providing instruction, planning and organising the curriculum.

2.3 CLASSROOM MANAGEMENT STYLES

Leadership is necessary to ensure that the execution of management tasks in the Mathematics classrooms is supporting goal achievement. Kruger and Van Schalkwyk (2016) describe leadership as a management component comprised of authority and power. Mathematics educators need to be able to influence learners as they provide feedback and show recognition of the learners' attempts to perform given tasks. In a classroom situation, it is known that an educator is the one to direct the teaching and learning activities. This may imply that the effectiveness of leadership determines how objectives may be achieved. The educator should be familiar with all the leadership styles which may be employed in various situations in order to enhance the effective guidance necessary for the improvement of education. This idea is supported by Grapragasem et al. (2015) who declare that the choice of a leadership style should depend on the instructional goals, learner needs and characteristics, and classroom activities.

The following three classroom management styles will be discussed in this section: the autocratic classroom management style, the permissive style and the democratic classroom management style.

2.3.1 The autocratic classroom management style

The autocratic classroom management style is a teacher-centred approach with minimal learner contribution. It is associated with very little learner participation which may be limited to listening, writing or working on a given task (Kruger & Van Schalkwyk 2016). Sahin (2015) describes an autocratic management style as an interventionist management strategy in which the educator controls the learner's behaviour, imposes classroom rules, and seems to utilise rewards and punishment for goal realisation.

Ari et al. (2015) assert that educators in the traditional classrooms are active while learners are passive recipients. The authors went on to state that in such classrooms, rewarding and punishing strategies are employed to enable goal achievement. However, learners' feelings and needs are not considered. Mirza and Iqbal (2014) observe:

> In general, Mathematics teachers teach from textbooks without relating the concepts to daily life experiences and they start lessons by dictating formulae and asking students to memorize those formulae in order to solve the questions. Mathematics teachers generally do not collaborate with colleagues to discuss concepts or teaching methodology.

This approach tends to view the Mathematics educator as one without the vital skills of creativity and who takes no consideration of learner needs (Akin et al. 2016, p. 773). Autocratic leadership style can also be utilised to temporarily control a class where bullying is rife as it is characterised by coercion and punishment (Allen 2010).

This implies that learners are considered passive elements whose contribution to teaching–learning is viewed as worthless. An educator can employ this style in a Mathematics classroom especially when introducing a new topic, giving instructions during assessments or when demonstrating how to solve a mathematical problem. In this instance, the educator is the one mostly active as learners are expected to be passive while paying attention to the educator's instruction. The above paragraphs indicate that an educator may employ more than one leadership style during a lesson, for instance the permissive management style, now discussed.

2.3.2 The permissive classroom management style

Weinstein and Romano (2015) explain the permissive management style as a management approach which enables an educator to provide warmth and affection as learners are free to decide what they want to do. It is an approach which is highly centred on the learner, involving a minimum of educator control. The subject content mastered by learners is not considered important since the primary focus is on the learner's thoughts and general feelings. More emphasis is placed on the learner's happiness than on achieving educational set goals. The educator remains at the background as learners make their own decisions, rules and create their own classroom space (Kruger & Van Schalkwyk 2016).

In the Mathematics classroom, the permissive management style is classified as a lazy-teacher management style or non-interventionist style which may yield non-productive outcomes (Sahin 2015). In addition, the approach may be used to enable learners report back on group work tasks. This

way, the educator is passive as the learners have the opportunity to express themselves. The permissive management style should be used cautiously for the shortest possible duration in order to yield positive results.

Apart from autocratic and permissive leadership styles, a Mathematics educator may decide to employ the democratic management style which is discussed in the next paragraph.

2.3.3 The democratic classroom management style

Kruger and Van Schalkwyk (2016) describe the democratic classroom management style as an interactive management approach which requires an educator to have an in-depth knowledge of subject content over and above the respect for individual values and differences. The notion is supported by Sahin (2015) who classifies the democratic style as an interactionist management style associated with involving the educator and learner collaborating and developing classroom rules together and sharing responsibilities for its execution. It is further explained that through the democratic style, emphasis is seen to be on individual differences, values and feelings.

Stols et al. (2015) contend that South African educators tend to follow a learner-centred teaching approach which was earlier explained as the recommended approach by the DBE (South Africa, DBE 2011). They further argued that, even
though educators are expected to support and follow learner-centred approaches, most of them actually employ the traditional approach in their classrooms.

An effective teaching–learning process may however take place when the educator is skilled, experienced, dedicated, responsible and knowledgeable enough to establish order and maintain the needed positive behaviour in the classroom, simultaneously meeting learners' needs as highlighted by Grapragasem et al. (2015) and Akin et al. (2016). This seems to imply that when an educator is not knowledgeable and experienced, the provision of instruction may not be properly carried out and as a result achievement of expected goals may become problematic. Similarly, if a

Mathematics educator lacks content knowledge, then such an educator will not be in a position to understand learner needs or differences, and may be unable to assist learners in solving mathematical problems. Thus, instruction provision become frustrating, and results in poor performance in Mathematics

Mathematics learners are expected to be actively and positively participating during the teaching–learning process, without taking the leadership role of the educator. It is also important to note that Mathematics educators should be knowledgeable enough to drive the provision of instruction in such a way as to build and maintain learner trust and confidence. In a Mathematics classroom, the educator can employ the democratic management style when introducing a new concept or demonstrating how to solve a Mathematics problem.

It is therefore important to understand all the leadership styles as they can be helpful when employed appropriately as discussed in this section. The leadership styles that can be utilised in a Mathematics classroom are: Autocratic, Permissive and Democratic.

2.4 THE FUNCTIONING OF EFFECTIVE CLASSROOM MANAGEMENT IN SCHOOLS

A classroom is a learning area whose management is critical for educational goals to be attained. This section will discuss the nature of effective classroom management, classroom management functions, components of classroom management and classroom administration.

2.4.1 The nature of effective classroom management

In this paragraph, the nature of effective classroom management is explained. Akin et al. (2016) views effective classroom management as the process of establishing, maintaining, and restoring the classroom environment in an operative way for teaching and learning. This warranted the researcher to define effective classroom management as: all efforts by an expert educator to ensure that a classroom environment allows the educator

to provide instruction with minimal distractions, learners being positively engaged and participating to achieve the teaching and learning goals – in this case, an improvement in Mathematics education.

This discussion emphasises the specific tasks that form part of classroom management, which is linked to what Grapragasem et al. (2015) describe as the types of classroom management, namely content management, conduct management, covenant management and time management.

2.4.1.1 Content management

Content management involves the management or administration of the curriculum programme, teaching or learning activities, materials, equipment and space. Akin et al. (2016) indicate that a disproportionate number of objectives with regard to the given amount of time to achieve them, inappropriate sequencing of the objectives and inappropriateness of the objectives to the learners' level of readiness, are all associated with classroom management problems. As such, in a Mathematics classroom, an educator's expertise to strategically analyse how to implement the work plan on content to be taught as specified in the CAPS (which is provided by the Gauteng DBE, is of vital importance. At times, the educator will have to speed up in order cover the work within the expected time as scheduled, irrespective of learners' understanding of the work which further impacts negatively to improvement in Mathematics education. In support, several authors have highlighted the importance of providing a work plan which is manageable and can be implemented in consideration of the class size, learner needs, curriculum requirements, resources and time availability in order to promote quality education thereby enhancing goal achievement (Spaull 2013; Etuk et al. 2013; Mirza & Iqbal 2014; Heyd-Metzuyanim& Graven,2016). Mathematics educators must in this case be knowledgeable of the contents that need to be taught, as well as the correct teaching methods to be employed to enhance learner's understanding. Effective teaching and learning can only be achieved when content management is applied by taking learner needs, their differences in background, and the availability of resources into consideration (Stols et al, 2015).

Content management therefore necessitates Mathematics educators to be responsive to new demands and ever-changing curriculum requirements. Educators are therefore expected to be patient, kind, and tolerant in order to understand content requirements of curriculum. The educator also needs to guide the learning process and this is done through the employment of conduct management, to be discussed in the next paragraph.

2.4.1.2 Conduct management

Conduct management is perceived by Grapragasem et al. (2015) as the procedural efforts employed by an educator to restore and maintain order in a classroom. Conduct management can thus be seen as a guide which explains what should be done, how it should be done and when/where it may be done. It spells out specifically what should not be done in a Mathematics classroom. An educator must initiate conduct management to construct classroom rules in accordance with governmental policies on discipline (Akin et al, 2016). Allen (2010) cautions that new educators tend to feel incompetent when it comes to managing curriculum, discipline issues and administrative tasks. It is recommended that workshops and/or staff development programmes need to be arranged to assist new and less experienced educators on strategies to be employed, for instance, how best learners can be involved in the teaching–learning process (Allen 2010).

Learners should be involved in the establishment of classroom rules. Learner involvement will enhance ownership and cooperation, otherwise learners may end up avoiding Mathematics lessons (Asikhia & Mohangi 2015). By assisting in setting up rules, learners should understand what is expected of them in a Mathematics classroom. Disruptive learners discourage goal achievement and the creation of a supportive environment. Allen (2010) posits that actions of all classroom parties affect the behaviours of everyone in the environment, thereby creating a dynamic context and culture. This calls for the educator's expertise to manage the behaviours, promote those which are acceptable while discouraging the unwanted behaviour (Akin et al. 2016; Seiz et al. 2015). It is therefore the Mathematics educator's responsibility to resolve any classroom disciplinary problem amicably. It is important to note that some challenging or sensitive happenings in a classroom need to be referred to the responsible authorities such as the school management team or the principal of the school.

Effective utilisation of content and conduct management strategies can yield better results if there is a sound communication base among the parties involved in the implementation of daily plan. The nature of the management strategy is the covenant management as highlighted below.

2.4.1.3 Covenant management

Covenant management is associated with interpersonal relationships between different stakeholders. It is not possible to create an environment conducive to teaching and learning, without first establishing sound interpersonal relationships between learners and educators and between educators and parents or among learners themselves (Bulls & Solity 2013). The notion is supported by Kruger and Van Schalkwyk (2016) who regard interpersonal relationship as an aspect of classroom management that enhances cooperation, trust, teamwork, and active participation by all parties to achieve a common goal. It is true that without covenant management, teaching and learning may not take place in the absence of a pleasant and encouraging classroom climate.

In a Mathematics classroom, covenant management will enable the educator to explain or demonstrate mathematical problems to the learners who are actively participating without hesitation or anxiety. Furthermore, a calm environment will enable constructive feedback to be provided timeously by the educator to the learners or any other parties involved (Unal & Unal 2012). Kindness, patience, friendliness and a sound communication network will have been established, thereby affording the flow of wanted behaviour as a result of employing covenant management and

simultaneously eliminating unwanted behaviour for the improvement of Mathematics education.

2.4.1.4 Time management

According to Grapragasem et al. (2015, p. 174), effective time management is a core skill that enables one to perform a current job and enhance career prospects with greater efficiency. Similarly, time management can be viewed as a fundamental administrative concern that governs efficiency and effectiveness of the classroom activities. It is therefore crucial in the practical learning and planning of classroom activities and in ensuring

that implementation is carried out and goals achieved as expected. In addition, time management governs the execution of the lesson, introduction of a concept or lesson, group work activities, and conclusion of a lesson (Forsyth 2007).

Furthermore, time management provides structure, and positions learning as experiential and an engaging activity. Akin et al. (2016, p. 772) assert that 'the actual time students spend on meaningful tasks is fundamental to their learning gains'. A Mathematics educator will therefore have to plan what needs to be taught and when, in accordance with the time scheduled for Mathematics lessons. The Mathematics assessments, as well as classroom activities both oral and written, need different time allocations and this entails time management if expected goals are to be achieved. It is not always easy to follow scheduled time on teaching and learning only for instance an educator spends time allocated to complete a task on attending to disciplinary issues or extracurricular activities like sports (Akin et al. 2016). It is therefore true that poor time management or attention to urgent non-academic issues may result in learners not participating actively or positively during the teaching–learning process. Lack of time management may lead to undesirable behaviour which includes learners becoming disruptive, incomplete tasks, lack of respect and trust for the educator as well as peers. The results of poor time management as explained by Akin et al. (2016) may be evinced by low pass rates in the subject, Mathematics.

The types of management explained above, namely covenant, content, time and conduct management, clearly indicate that there is an interdependency effect. It can be seen that a knowledgeable, skilled, fully equipped, friendly and dedicated Mathematics educator will be able to plan and execute those plans in a welcoming environment that accommodates the active participation of learners governed by the school policy and rules, to enable effective classroom management for the improvement of Mathematics education. This leads to a discussion on the classroom management functions.

2.4.2 Classroom management functions

Various authors give different expositions of the role and functioning of management functions in classroom management (Weinstein & Romano 2015; Foster 2015; Akin et al. 2016; Kruger & Van Schalkwyk 2016; Seiz et al. 2015). Based on the expertise of these authors and the applicability to Mathematics classrooms, the researcher selected communication, motivation, setting of rules and policies, decision-making, assessment and evaluation as the crucial functions for this study.

2.4.2.1 Communication

According to Etuk et al. (2013, p. 198), 'No subject matter can be learnt properly without communication, the use of its appropriate terms facilitates the understanding of whatever is being learnt'. Communication has to do with the conveying of messages to which the receiver is anticipated to respond. In a classroom situation, the educator and the learner convey to each other their needs, feelings, attitudes and information (Seiz et al. 2015).

Communication can be verbal like sounds, or words, while non-verbal communication embraces body movements, face and eye coordination and vocal behaviour (Foster 2015). If a learner behaves differently from what is expected, it may imply that the message was not clear. Mathematics educators should thus employ both verbal and non-verbal cues to maximise communication in order to improve understanding.

Ersozlu and Cayci (2016) propose that communication is one of the critical skills a good educator is expected to possess. According to Etuk et al. (2013, p. 198), 'No subject matter can be learnt properly without communication and the use of its appropriate terms facilitates the understanding of whatever is being learnt'. The effectiveness of any classroom interaction is determined by the competency of the educator and the sustainability of communication between the educator and learners (Ersozlu & Cayci 2016). As such, Mathematics educators should have good communication skills to enable learners understand what is being taught. Communication is used to meaningfully transfer messages, or may be used in the transmission or exchange of ideas, knowledge, beliefs, attitudes or emotion (Weinstein & Romano 2015). It is important that communication should be warm, friendly, without fear in order to enhance a sustainable positive relationship between the learner and the educator which encourages active learner participation (Grapragasem et al. 2015).

Smutny and Fremd (2011) maintain that educators are viewed as masters at designing communication in their classrooms. This may imply that careful planning is called for as the nature of instruction tends to be determined by the physical outlook of a classroom which communicates a message to onlookers (Ersozlu & Cayci 2016). The general appearance of a Mathematics classroom through displays should be self-descriptive to such an extent that it can be clearly seen as a Mathematics classroom. Cangelosi (2013) said in this regard that a well-structured and organised syllabus gives the impression that everything is well communicated and ready to be run in a business-like manner. Mathematics educators need to expertly take time organising and designing classrooms in order to enhance an environment conducive to teaching–learning Mathematics. This implies that when the Mathematics educator communicates instructions to learners during lessons, learners are likely to respond positively.

To enhance operative communication in managing Mathematics classes, some factors and principles must be considered and adhered to. The circumstances and situation need to be taken note of (Kruger & Van Schalkwyk 2016). Etuk et al. (2013) add that competent educators seeks to know their learners' behaviour in teaching, and must perceive the individual learner as a whole since the learner has affective, cognitive and psychomotor talents. An educator needs to understand the learner's socio-economic background and approach them with friendliness or sympathy with a positive mind, calling them by their names, shaking hands when possible, establish goals, allow learners sometimes to evaluate a lesson showing respect and trust, to keep learners motivated (Larmer, Baker & Gentry 2016). Hence in a Mathematics classroom, learners should be encouraged to be open-minded and express their opinions freely, since understanding one concept will enable them to be better prepared for the next lesson, as mathematical concepts are interrelated

Kruger and Van Schalkwyk (2016) further advise on the crucial aspect of communication with parents. They suggest that educators must communicate learners' progress with their parents. Results of standardised test programmes, examinations breakdowns, results of tests and examinations must all be communicated to parents. If this kind of communication is done timeously, unnecessary criticism will be avoided and relevant steps for remedial classes will be acceptable to parents.

Furthermore, it seems a common practice to give learners feedback on class work, homework, formal or non-formal assessment timeously. This information should also be sent to parents in order to enable them to play a meaningful role in the development of their children. In some instances, aftercare programmes like extra classes may result in better understanding and trust between educators and learners, and between educators and parents (Chambati 2015). Intervention programmes should be sensitive, flexible and focused on satisfying community goals (Chambati 2015).

2.4.2.2 Motivation

Berkova and Krejcova (2016) recommend, based on self-determination theory, that educators utilise external motivation in order to create intrinsic motivation, particularly in circumstances where the task or activity has a value attached for the learner. They contend that in education, motivation is age-related. Therefore, the younger the learner, the greater the expectation to get a reward in order to perform a task, while older learners become more intrinsically driven to perform a task. Hence, adults are motivated by their dreams, for instance, by the drive to acquire a degree.

Fontana (2014, cited in Berkova & Krejcova 2016, p. 81) points out that 'motivation can be described as one of the crucial influences that determine the effectiveness and fruitfulness of an educational process; no learning at school occurs without motivation'. Kruger and Van Schalkwyk (2016) describe motivation as the process by which motives are provided by managers (in this case, by educators) in order to bring about certain actions such as learning to achieve goals. Motivation is therefore an attempt to make learners become interested in an activity.

Weinstein and Romano (2015) assert that when learners enter a classroom already motivated, educators tend to respond positively by giving support, affection and encouragement. By contrast, when learners come to class unmotivated, the educator tends to become coercive or neglectful (Weinstein & Romano 2015). Mathematics is generally known as a challenging subject; therefore, it is important to make the subject fun. Ayers (2010, p. 201) supports this recommendation, commenting that 'fun is distracting, amusing and diverting. Clowns are fun. Jokes can be fun. Learning can be engaging, engrossing, amazing, disorienting, involving, and often deeply pleasurable'. When given the right motivation, learners (like anyone else who has needs) will want to fulfil those needs. If Mathematics learners are motivated, they may cooperate, learn and achieve their goals, thereby improving performance in Mathematics education.

Another problematic issue that applies particularly to Mathematics classrooms is that some learners may be hesitant to participate in classroom activities because of the fear of making mistakes (Swafford & Findell 2001). Stols et al. (2015) suggest in this regard that learners can be motivated by directing them to informal notions of partitioning, sharing, and measuring by providing them with elementary ways of building concepts of rational numbers. Such an approach should build confidence for participation during formal instruction time. Also, Biza et al. (2015) purport that offering praise, encouraging learners to participate, judging appropriate questions, and inviting explanation may contribute to learners' positive participation during instruction.

Bulls and Solity (2013) suggest that educators should not make comments which express their interpretation of the learners, since such comments may not be reflecting what the learner has actually done, or may portray an incorrect image of who exactly the learner is. Some comments are only suppositions of the educator's observations; therefore, if the comments are negative, learners may feel withdrawn and discouraged from participating in class (Bulls & Solity 2013).

Mathematics learners may be motivated by various things which may include basic human needs, spiritual needs, expectations, rewards, punishment/fear, interest, abilities/skills, nature of a task, the aim of a task, the degree of difficulty of a task or other people's influence. Educators should strive to motivate Mathematics learners by understanding their backgrounds, which makes it easier to understand their needs, and then employ the correct strategies to make learners work to improve academic their results (Kruger & Van Schalkwyk 2016).

Weinstein and Romano (2015) recommend that to enhance effective classroom management, learners should be motivated to perceive academic activities meaningful and worthwhile. Some years ago, Malehorn (1984, cited in Berkova & Krejcova 2016) observed that the responsibility of an educator should extend well beyond distributing materials and explaining concepts, to supervising the routine of the subject being taught in order to motivate learners, since the motivation of learners is significantly determined by the personality of the educator.

Mathematics as a subject is generally perceived as difficult and learners may develop anxiety about Mathematics lessons. Motivation is therefore a crucial element for effective classroom management to enhance an improvement in Mathematics education.

2.4.2.3 Setting of classroom rules and policies

In order to run effectively, each organisation has to follow set rules and policies to guide the behaviour of its employees. A classroom, just like any organisation, should have rules and regulations set as guidelines to be followed by learners (Ersozlu & Cayci 2016). This section of the literature review briefly explains the setting of classroom policy and classroom rules for effective management of Mathematics classes. A classroom policy is an interpretation of the school policy or guidelines, which is used by educators in a classroom to ensure goal achievement. The classroom policy can also be seen as a general guide for teacher–pupil behaviour in a classroom setting (Kruger & Van Schalkwyk 2016). Classroom rules are then used to implement the classroom policy.

Weinstein and Mignano (1993), cited in Kruger & Van Schalkwyk 2016) argue that clear rules and routines decrease the complexity of the classroom. These authors explain that rules minimise confusion and prevent the loss of instructional time, thus enabling the educator to carry out housekeeping tasks like taking attendance, distributing materials and cleaning up, and making it possible for educators and learners to concentrate on the real tasks. Haysman (2016) advises that classroom rules should be agreed to by the class but must derive from the school rules; any adjustments should be communicated to the responsible authorities.

The best rule is respect for each other (Haysman 2016). The notion implies that the Mathematics educator respects the learners and at the same time learners respect the educator. It is perceived that once there is mutual respect, everything else falls into place automatically. Kruger and Van Schalkwyk (2016) assert that classroom rules should be functional and practical, short and clear, must be kept to a minimum, must be clearly displayed if possible, on the notice board, should show positive statements and should include learners' contributions. Akin et al. (2016, p. 774-775) mention the following classroom management practices that teachers mostly employ in schools in Turkey:

> Rules and routines, coping with misbehaviours, and establishing teacher-parent cooperation, individual talk about reason, talking with the disruptive student after the class, changing the group of the student, verbal and non-verbal warning, intonation, eye contact, hand clapping, monitoring, positive reinforcement, getting help from the school administrators or the psychological counsellor, purposeful ignorance, assigning responsibilities, punishment, sending out, use of humour, providing instructions, reminding the class rules, asking questions, and reprimanding.

The same can be true of South African schools. It would be beneficial for Mathematics educators to utilise most if not all the identified practices. In the case of Mathematics classrooms in particular, it is recommended that educators should take a roll call at the beginning of a class so as to establish which learners are absent or late for the lesson. Other consistent procedures to be followed are the checking of homework and ensuring learners' participation. Haysman (2016) suggests completing lessons by asking evaluative type of questions at the end.

Rules and policies are important when controlling and monitoring learner behaviour as discussed. Mathematics educators are also expected to make sound decisions to enhance effective classroom management. The next paragraphs highlight decision-making in a classroom setting.

2.4.2.4 Decision-making

Kruger and Van Schalkwyk (2016) define decision-making as the process of choosing the most suitable way of solving a problem or handling a situation which involves identifying the problem, identifying possible solutions, evaluating and choosing an alternative, implementing the decision and evaluating the decision. It may be important to note that decision-making is a process in that while finding a solution to a problem, another problem may be identified during the evaluation step and the process continues cyclically.

According to Allen (2010), when a learner disrupts a class and challenges an educator, publicly embarrassing or belittling him or her, the educator may react with anger, hostility, and coercion. The researcher in this case advises Mathematics educators not to react in anger as this may disrupt the whole lesson and that attention should be given to the rest of the class while not paying attention to the misbehaving learner. However, if the

disruption continues, the educator may seek for the assistance of the school management team, who will in most cases remove the problem learner from the class and attend to the learner from the administration office while the rest of the class continues with the lesson.

Some learner reactions may be in response to the choice of a strategy being engaged during instruction. Educators should make sound decisions which relate to more effective ways of interacting with learners and shape their behaviour in more positive ways (Allen 2010). Turner, Midgley, Meyer, Gheen, Anderman, Kang and Patrick (2002) suggests that an educator may decide to employ the reward and benefit method which the author names "A Multiple-Person Game of Classroom Discipline". In a Mathematics classroom, learners can be placed in small groups of three or four where tasks are given and groups monitored as they carry out the tasks. Rewards can then be given to the groups who behave well or who might have improved. However, it is essential to note that monetary rewards should never be offered. Rewards, as explained by Turner et al (2002), can be in the form of improved marks or better understanding. In addition, good comments, merit badges or even stamps can reward learners. Some decisions regarding sensitive issues or other unexpected issues which may take place in a classroom can be referred to the Mathematics HOD, the school management team or the principal.

2.4.2.5 Classroom assessment/grading

There are two important phases of assessment as daily classroom management activity, namely external induced assessment and internal grading (Yazici & Sozbilir 2014). In South African schools, Mathematics educators are involved in the management of a wide range of external induced assessments. Apart from the Grade 12 examinations, regional assessments such as SACMEQ, the Trends in International Mathematics and Science Study and the Annual National Assessments, are conducted (Spaull 2013; Heyd-Metzuyanim & Graven, 2016). Internally, grading is conducted to determine the progress of learners.

The management of evaluation of Mathematics learners' work or progress can be carried out daily, weekly, fortnightly, monthly, or at the end of each school term depending on the nature of the assessment tool and purpose of assessment. Evaluation can be arranged to be carried out before

Mathematics lessons to ensure that learners are ready for the day's task, during the lesson to ensure that learners are understanding the mathematical concepts, or at the end of the lesson or topic to determine the general comprehension (Kruger & Van Schalkwyk 2016).

Hochweber, Hosenfeld, and Klieme (2014) suggest that, when conducting assessment and grading exercises, educators include "non-achievement factors" for instance absenteeism or overcrowding as an attempt to serve important goals of instruction, including motivating learners and providing disadvantaged or weaker learners with a fair chance to succeed. This implies that grading can motivate learners to improve their performance – but the exercises could also demoralise underperforming learners. Mathematics educators should therefore exercise their grading activities in a professional way and based on ethical considerations.

Apart from academic achievement as an outcome of grading, educators should also assist learners to identify their strengths and weaknesses, encouraging them to work harder (Hochweber et al. 2014). Even though assessment may have several advantages, Yazici and Sozbili (2014) point out that one of its weaknesses is that results from an assessment may show improvements in the pass rate, but they do not show much in terms of learner's understanding in relation to more efficient methods and conceptual strategies. Assessments do not take into cognisance some relationships, for instance, between results and learner backgrounds, or results and participation in class (Hochweber et al. 2014). The notion necessitates Mathematics educators to attempt to understand their learners' backgrounds in order to set meaningful tests or examinations matched with the Mathematics curriculum requirements, and later evaluate objectively in order to make constructive decisions

Several judgements are given following assessment results each year. According to a National Assessment Circular released on 1 December 2016 (SA DBE, 2016):

> A learner who has met all the requirements for passing to the next grade but has not achieved 40 per cent in maths and therefore has to be held back, should be condoned (allowed to proceed to the next grade) if their mark is higher than 20 per cent.

> This decision allowed learners who had failed to continue to the next grade, of which, in a few years to come, the pass rate may drop appallingly from the improvement in Mathematics pass rate of 51,1% for the class of 2016.

School-based mathematical assessments include standardised tests, assignments, informal worksheets and, at times, some evaluative oral tests. As a result of the changes and developments in the curricula, assessment and evaluation also follow the same developmental change (Yazici & Sozbilir 2014). However, educators who lack updated knowledge may be less competent in utilising alternative teaching strategies or in effectively implementing newly introduced curriculum changes. The notion suggests that Mathematics educators upgrade their knowledge base, as this may bring about a positive and meaningful relationship between the level of competency and the frequency of employing changes in assessment and evaluation strategies.

McMillan (2001), cited in Lejonberg, Elstad and Christophersen (2015) stresses the importance of evaluating educators' teaching practice to enhance improvement. Such an evaluation will enable weaknesses and mistakes to be identified and rectified in time, while the strengthening of an educator is noted and applauded by the researcher. A Mathematics educator is expected to have the instructional knowledge and skills which will enable adaptation to changes in the curriculum, and to implement what has been planned (Etuk et al. 2013; Kruger & Van Schalkwyk 2016; Berkova & Krejcova 2016). This may suggest that evaluation can be done after some oral, written or practical assessments resulting in the improvement of Mathematics education. In addition, the researcher advises Mathematics educators to continuously assess learners formally or informally as pointed out during data collection. Written assessments should be filed and utilised as reference for decision making such as promotions or progression. Hence educator knowledge is valid in identifying the assessment instrument, content of assessment as well as supervising the implementation of the assessment regardless of the class size.

In order to effectively employ classroom management functions as discussed above, it is equally vital to understand the components of classroom management, which is the focus of the following section.

2.4.3 COMPONENTS OF CLASSROOM MANAGEMENT

This section discusses the learner's contribution, the educator's contribution, and teaching–learning activities as components of classroom management.

2.4.3.1 Learner contribution as component

Kruger and Van Schalkwyk (2016) advise that learners influence the manner in which teaching and learning and classroom management takes place. The Mathematics educator is expected to take into consideration individual needs in the teaching and learning situation such as learner's abilities, age, gender, background, aspirations, physical conditions as well as attitude towards peers, the subject being taught, and the school in general, when managing the classroom. This notion is supported by Etuk et al. (2013, p. 197) who maintain that 'a competent teacher seeks to know his learners' behaviour'. These authors continue that a competent teacher should seek to know individual learners' abilities, strengths and weaknesses. By understanding the learners' needs, a Mathematics educator is able to choose a more precise approach to enable learners to become responsible and involved in a helpful environment in the classroom, which may result in improved and overall acceptable Mathematics performance.

Marquez et al. (2016, p. 89) warn that 'inappropriate student behaviour resulting in chaotic classrooms remains a major challenge for teachers. It is true that no learning can take place when there is no discipline in a classroom. In support, Greenberg, Putman and Welsh (2014) stress that a well-crafted lesson may not be well delivered if learners are not well-behaved during instruction time. The educator must keep the class under control in order to impart knowledge and the smooth provision of instruction. Learner presence and cooperation is therefore a vital element of a classroom as a unit of management, as it contributes to a learner's conceptual development (Gardee & Brodie 2015). As such, there should be a relationship that enables learners to express themselves without hesitating. Any figure errors they make, which may result from carelessness, lack of knowledge or understanding, actually help the educator strategise to ensure such mistakes are rectified before examinations. (Hochweber et al. 2013). The quality of relationship between educator and learners is crucial as it determines the academic development as well as meeting other social needs of the learner (Kruger & Van Schalkwyk 2016).

Protheroe (2007, as cited by Stols et al. 2015) explains that in a Mathematics classroom, learners are expected to be actively engaged in doing Mathematics activities, for instance working on challenging problems, making interdisciplinary connections, communicating mathematical ideas and generally encouraging each other. This expected active participation is in line with the recommendations and goals of learner-centred, outcomes-based education in South Africa which sought to encourage important problem-solving and critical-thinking skill. This curriculum has since been replaced by CAPS which was initially implemented in 2012 in order to improve the quality of education in South Africa.

According to the researcher's point of view, by studying Mathematics, a learner develops skills in problem-solving, decision-making, critical thinking and can become creative. The importance of studying Mathematics can put so much pressure on the learner which result in learners experiencing extreme enervation, and at times a lack of acceptable concentration to enable them to participate during lessons (Mirza & Iqbal 2014; SA DBE 2011). Learners in a Mathematics classroom are therefore expected to develop several skills and abilities which they may later employ in various professions like engineering, accounting, technology or in the medical field. However, the Mathematics decision the DBE took to impose at the end of 2016 may discourage some learners from working hard as they will assume that a 20% pass rate can take them to the next grade; this may make it challenging for the educator to manage the class and promote better results and improved performance in Mathematics.

Heyd-Metzuyanim and Graven (2016) explains Mathematics as a progressive subject whereby learners are required to actively construct knowledge during participation in the mathematical activity, and the mathematical concepts progressively build on earlier concepts. Therefore, learners' presence and participation in Mathematics during instructional process is very important to ensure classroom management. The success of the learner, as a component of classroom management, is only possible in the presence and expertise of the educator.

2.4.3.2 Educator contribution as component

Ersozlu and Cayci (2016, p. 144) confirm that the "teacher's point of view on classroom management is of vital importance for the success of teaching". The view suggests that the educator is a key component in the classroom. If an educator is knowledgeable and skilled, there is a greater probability of such an educator producing excellent results in any assessment given. Stols et al. (2015) propose that educators should possess the

following qualities for effective classroom management: optimism, supportiveness, patience, kindness, care, and enthusiasm. Educators should also be able to utilise both preventative and developmental teaching models. Preventative models involve developing a classroom climate that can discourage unwanted behaviour and encourages desirable behaviour, while developing learners' ability to solve mathematical problems. By applying good classroom management, the educator is empowered to effectively perform all teaching–learning activities carried out in an environment conducive to goal achievement. (Ari et al. 2015). In addition, Kruger and Van Schalkwyk (2016) observe that if an educator fails to carry out expected core duties efficiently, effective classroom management will also become problematic.

Ciascai, Haiduc and Felezeu (2014) suggest that educators should introduce up-to-date knowledge and skills in their classes because of the ever-present changes and developments in society. Etuk et al. (2013) maintain that the way in which learners perceive their educators' knowledge relates significantly to the learners' attitude towards the subject, in this instance, Mathematics. The competence and confidence of educators exhibited in their teaching and in their classroom management, is viewed as a reflection of in-depth knowledge. This implies that Mathematics educators must possess a deep understanding of the Mathematics content that they intend to teach, in order to enhance trust and build confidence in learners (Weinstein & Romano 2015; Akin et al. 2016). Teachers' subject and management knowledge should continuously be upgraded through workshops and in-service programmes.

It is important to note that educators are judged by learners or the community in general in terms of their qualification, communication skills, teaching methods, and general appearance in addition to overall assessment outcomes (Etuk et al. 2013). The unforeseen challenges Mathematics educators face to enhance effective classroom management will, in turn, earn them a better judgement in improving their Mathematics classrooms. Etuk et al. (2013) further emphasise that an educator's effective communication clears ambiguities, simplifies concepts and clarifies principles. Ersozlu and Cayci (2016) affirm that a good educator understands the learners' needs and values, without making the learners experience a feeling of failure. It follows therefore that effectively communicating unambiguous mathematical terminology by using a friendly, patient tone, enable the

educator to inform, stimulate, persuade and remind learners of Mathematics concepts taught, thereby enhancing understanding as well as application of mathematical skills and knowledge acquired.

Foster (2015, pp. 266-267) explains:

> If educators can improve their ability to exploit unexpected non-mathematical situations mathematically, they may assist learners in their learning, while also granting them a greater sense of autonomy over the direction of the lesson. By extracting from such unexpected situations, or bringing into them, a relevant task of mathematical value, the educator capitalises on the hidden potential of his learners.

Furthermore, Foster (2015) alludes to the fact that not all unexpected events are negative; it may be possible to encounter unexpectedly stimulating events. In this way, unforeseen activities may contribute towards creating a better classroom culture that embraces unexpected circumstances. In support, Rowland and Zazkis (2013, p.144) find that 'The educator's response to the unexpected ideas and suggestions from learners is one of three kinds: to ignore, to acknowledge but put aside, and to acknowledge and incorporate'.

Etuk et al. (2013) suggest that educators should take extra responsibility to be innovative, employing varieties in their instructional delivery to keep their learners always alert and prepared to react positively and learn. When learners perceive that their educators are adopting appropriate methods to teach them, they become more actively involved in the teaching–learning process (Etuk et al. 2013). Hence the educator's possession of mathematical knowledge and skills to efficiently and effectively manage Mathematics classroom is vital for the improvement of results and Mathematics education in general.

According to Kruger and Van Schalkwyk (2016), an educator who has the professional knowledge and expected personal characteristics is viewed as the most important classroom components. Such an educator is valued as the axis around which all activities in Mathematics consequently revolve. Kruger and Van Schalkwyk (2016) identify the following requirements to be met by the educator to enhance effective classroom

management for improved Mathematics education: trustworthiness, sound leadership skills, being accommodative, having an in-depth knowledge of subject content and learners' background and needs as well as being skilled enough to create an environment conducive to teaching–learning and simultaneously employing various teaching methods.

The effectiveness of classroom management when teaching Mathematics may be hampered by an educator's lack of knowledge of concepts to be taught (Stols et al.2015). Because the attitude of learners towards Mathematics learning is significantly related to how learners perceive their educator's ability (Etuk et al. 2013), the educator is advised to take heed of some learners who may have anxiety. Mathematics anxiety is defined by Sparks (2011) as negative emotions capable of disrupting better performance in the subject. Sparks (2011) explains that Mathematics anxiety usually comes from negative experiences in working with educators, tutors, classmates, parents or siblings. This observation suggests that continuous innovation is viewed as an important action in education, particularly in Mathematics as it brings about new content as well as new strategies to teach the content. As such, with continuous readiness of professional competence as the "knowledge bank" and good educator qualities, Mathematics educators can utilise classroom management for the achievement of better results to enhance an improvement of Mathematics education.

2.4.3.3 Teaching and learning activities as component

Educators, as discussed, are required to be more productive and creative in the classroom (Grapragasem 2015). Mathematics educators are expected to implement a working plan consisting of teaching and learning activities according to the time allocated to complete the suggested activities (ATP) which is made available to schools at the beginning of the year annually by the Gauteng DBE. This requires Mathematics educators to exercise efficient utilisation of available resources to enhance an improvement in Mathematics education.

Kruger and Van Schalkwyk (2016) describe learning content as what constitutes the means by which one may attain learning goals or objectives. It was further elucidated that the learning content is prescribed and arranged through the school curricula by the use of recommended books and scheme/lesson plans. Cangelosi (2013) points out that a well-organised syllabus gives the impression that the course is in order. The learning

content can be simply expressed in the form of a lesson plan. Educators appear to face challenges emanating from continuous changes and developments in the curriculum (Ciascai et al. 2014). In response to the fact that the teaching and learning is continuously changing, Mathematics educators are advised to take into consideration the various changes as they make daily lesson plans. In addition, Ari et al. (2015, p. 365) propose that 'in-class activities should be designed in accordance with the physical, mental and affective developmental steps of the learners. It is important therefore, to note that the provided working plan (ATP) serves as a guide and Mathematics educators still need to relate to learner needs so as to decide on the relevant teaching methods and resource availability to enhance goal achievement. Accordingly, a Mathematics classroom may involve task determination, task analysis, task arrangement, task allocation, introduction of regulations and even establishing relationships (Kruger & Van Schalkwyk 2016). As such, it can be concluded that it is through effective organisation that a class monitor understands his/her duties. The learners will know when to submit workbooks, who marks homework and how the marking is conducted, as well as the regulations applied when a learner misses a Mathematics assessment. Learner participation is therefore a vital element in all tasks and activities during the teaching–learning process (Akin et al. 2016).

Furthermore, Hochweber et al. (2013) claim that educators should be involved more in classroom management activities and less in achievement-related interactions, as that may impair the educator's ability to assess fairly. Mathematics educators should consider the learners' level of ability as they carefully select the teaching and learning activities to be utilised. Activities related to an effective lesson include educators giving clear instructions, educators empowering learners to discover, learners being able to give correct answers thus developing their own thinking styles, and learners being motivated and getting interested in the work (Stols et al. 2015).

On the other hand, Kruger and Van Schalkwyk (2016) suggest that learner activities depend on the nature of the subject and the interaction skills of the educator. The objectives and learning content of the teaching and learning activities need to be considered and clearly laid out. Kruger and Van Schalkwyk (2016), who expressed further express an understanding that the learning goals or objectives of a teaching and learning situation determines the nature and course of aspects to be followed in order to attain set goals.

Furthermore, Kruger and Van Schalkwyk (2016) suggest that every lesson should have at least an objective which guides the educator on what is expected to have been accomplished by the end of that lesson and that such objectives may influence the manner in which the educator manages the teaching–learning activities. This implies that set objectives assist the Mathematics educator in selecting instructional materials and strategies to be employed, for example, learners being able to solve simultaneous equations using the elimination method. This research study will however attempt to establish whether the Mathematics educators in Gauteng are stating objectives clearly when planning for each lesson so as to augment effective classroom management.

Towers and Davis (2002, cited in Foster 2015) advise that lesson plans, 'should not be framed in terms of trajectories, itineraries, or blueprints, but as exercises in anticipation. The lesson plan is an event of preparation, not pre-specification.' This suggests that an educator should use the curricula, which may be the prescribed syllabi, by carefully coming up with planned objectives achievable within the designated Mathematics time.

Towards the end of a lesson, an educator normally gives classwork or homework. Homework is an important teaching and learning activity for the improvement of Mathematics education. Kruger and Van Schalkwyk (2016) explain that homework should not be treated only as a proof of work done in class; it may also indicate a learner's feelings and attitudes concerning positive learner behaviour expected by the school and parents as they check their child's progress through homework.

The researcher is of the opinion that homework should be related to the content taught in order to motivate and build some interest in the subject of Mathematics, rather than being given as a punishment. The purpose and duration should clearly be explained. In Mathematics, homework enables and encourage learners to practise what has been learnt. Homework tasks therefore tend to summarise what has been learnt and should be given timeously. However, in this research study, the researcher focuses on establishing how educators in Gauteng province are utilising homework activities to enhance effective classroom management for the improvement in Mathematics education.

The section has discussed the nature of activities and the importance of having the curriculum tasks which takes cognisance of the learner's level of ability, availability of the resources and the educator's skills. The following section discusses the classroom administration.

2.4.4 Classroom administration

According to Ersozlu and Cayci 2016 classroom management involves all segments of education which include administrative educator responsibilities. Kruger and Van Schalkwyk (2016) explain that classroom administration facilitates teaching, in that it enables educators to create and maintain a neat and well-organised classroom where instruction can be provided in a calm and helpful environment. In this study, the term "classroom administration" will accordingly be used to portray the influence and importance of the more physical aspects of the classroom such as class size, classroom seating plan, furniture arrangement, and displays.

2.4.4.1 Class size

Handal, Watson and Maher (2015) confirm that class size directly affects the attention which educators pay to individual learners, the amount of investigative work undertaken as well as the classroom management practices to be employed. Handal et al. (2015) explain that Mathematics educators should not distinguish between the pedagogies for smaller or larger classes. Although small classes are important and highly influential in increasing learning outcomes and creating opportunities for individual learner differences especially on individual learner assistance on demonstrations such as construction of shapes/angles. Furthermore large classes are cost effective and enhance occupation of physical space as more learners are accommodated in one room and one educator assigned to teach them.

Another important perspective that Handal et al. (2015, p. 2) provide is that 'class size does not influence learner achievement directly. Instead, it is what educators and learners do in smaller classes that matter'. Although the quality of learning and teaching in Mathematics classes depends on learner characteristics such as their background, language skills, level of learning ability as well as the educator's knowledge of Mathematics concepts and skills, class size is nonetheless important for effective classroom management.

In most cases, the more learners who are in one class, the more challenging it may be for the educator to control and effectively manage the class. This exhaustion may impact negatively on learners' achievement since it may hamper the educator's ability to assist individuals when needed. The notion is supported by Seiz et al. (2015, p. 15) whose study indicated that 'highly exhausted teachers reported increased feelings of anger and lack of enjoyment during instruction'. In Mathematics classes, educators need to enjoy instruction provision and assist learners in groups or individually as they solve given mathematical problems, thus assessing whether the learners understand concepts taught.

Since class sizes are determined by school enrolment as well as by the financial ability of schools to employ additional qualified Mathematics educators, educators can do very little about class sizes themselves. They can however arrange, organise, and plan individual classes to obtain maximum efficiency. Although part of this research study examines how class size impacts on effective classroom management for improved Mathematics education, attention will also be paid to the effect of managerial requirements such as the appearance of classrooms as well as seating arrangements, on classroom management.

2.4.4.2 Classroom seating plan, furniture arrangement and displays

Smutny and Fremd (2011) declare that educators are viewed as masters at designing their classrooms. The general appearance of a Mathematics classroom through displays should be self-descriptive so that the room can definitely be experienced as a Mathematics classroom. Mathematics educators therefore need to expertly take time organising and designing classrooms in order to enhance an environment conducive to teaching and learning Mathematics.

Seating can also be formally arranged, depending on the activities, learner needs, learner behaviour, number of learners and teaching–learning content to be achieved. If activities are not formally decided, effective classroom management can be a challenge especially for new and less experienced educators (Seiz et al. 2015). It is important to note that the different seating arrangements may each suit a particular activity.

Kruger and Van Schalkwyk (2016) add that the utilisation of classroom space must be related to the content and aim of the subject. A classroom should have working and walking space free from obstacles, the teaching and learning materials must be easily accessible, and the classroom must be inviting as well as functionally and attractively furnished (Kruger & Van Schalkwyk 2016).

When planning for furniture arrangement, it is suggested that a U-shaped design may give all learners a good view of the proceedings and an equal chance for classroom interactions, while clusters may be best for small group projects and promote social contact and collaboration. Cluster setting enables learners to learn from each other's diverse backgrounds both academically or socially. In addition, some writers highlight that row and column seating arrangements may be appropriate for traditional lectures, being more beneficial to learners in the front than at the back, while a theatre-style shallow curve may be best for viewing related instructions (Kruger & Van Schalkwyk 2016; Malehorn 1984; Smutny & Fremd 2011). In a Mathematics classroom, the seating arrangement may depend on the concept being taught, resource availability, as well as size of the class.

It is essential to note that, ill-disciplined learners tend to position themselves at the back of the classroom or closer to windows than sitting in front, close to the educator's desk. It is also true that learners who are more interested and eager to learn position themselves at the front. Mathematics educators should attend to all learners regardless of where they sit, to ensure effective classroom management.

Haysman (2016) who is an instructor for "classroom management" points out that when entering a classroom, learners are expected to be hit with vibrant colours on the walls, natural lighting from the windows and an inviting sensation that encourages learner participation and also promoting a climate conducive to teaching and learning. Learners who inhabit such a classroom may wish to stay there much longer. This encourages Mathematics educators to create and maintain their classrooms in as neat and inviting a manner as possible.

Classroom displays must include learners' work according to Weinstein and Romano (2015) who suggest that educators may personalise classroom space by displaying learners' birthdays, a "learner of the week" bulletin board or best work from each learner. Long ago Malehorn (1984) stressed that many behaviour problems arise from inappropriate classroom arrangement and suggests that learners must be involved in the planning of the

optimal seating arrangements as well as the arrangement of other equipment and furnishings in the classroom. The involvement of learners can lead to learners working hard in Mathematics so as to get better results and have their work or achievements displayed. Community and collaborative learning can also be heightened as displays remind learners of mathematical concepts and formulae.

According to Smutny and Fremd (2011), a prepared classroom space may enable one to create adjustments more easily. It is necessary to note that if furniture arrangement is not carried out timeously, this can result in loss of teaching time, chaos and confusion.

The section highlighted effectiveness of a seating arrangement which is situational. Mathematics educators need to establish a climate conducive to the improvement of Mathematics education, which is the focus of the next paragraph.

2.4.4.3 Classroom climate

A classroom is a living and working space for learners, and for the educator as manager. Twemlow, Fonagy, Sacco and Brethour (2006, p. 189) advise: 'Teachers are critical in determining the school climate and their attitudes to power dynamics are extremely relevant.' The educator is therefore expected to create an environment and climate which is conducive to teaching and learning. Classroom climate is explained as the emotional or social state of the classroom which could be positive when warm, friendly or sincere – but can also be negative when tense, introverted or stern (Kruger & Van Schalkwyk 2016). In the same vein, Etuk et al. (2013, p. 198) make the following statement:

> The atmosphere in the classroom needs to be relaxed, free from threats and anxiety, non-competitive and thought-provoking to allow learners to participate and enjoy the lesson. Under such atmosphere, the learners' interest in and attitude towards the subject taught could be enhanced.

It is therefore important that the classroom climate for effective Mathematics teaching and learning is one which is friendly, warm and motivating for learners to actively participate during instruction time.

The effectiveness of lesson delivery depends to a large extent on the classroom climate. The classroom climate can be relaxed, friendly, unfriendly, calm, cooperative, discouraging or indecisive. The classroom climate may be favourable or unfavourable but it is obviously preferable for learners to have trust in themselves and in their peers and to work in an atmosphere of mutual collaboration and respect. When learners do not trust their educators, they do not pay attention in class and this can emanate in chaos. Peters (2013) stresses that self-efficacy can be a contributory factor to the classroom atmosphere since Mathematics instruction may need to be augmented by classroom climate. Furthermore, Stols et al. (2015) propound that beliefs may shape an educator's perceptions and that such beliefs and educator knowledge may determine how educators value the subject or the learners, thereby creating a climate which could be favourable or unfavourable to teaching and learning. The lack of this self-efficacy in relation to Mathematics education has been identified as a significant contributor to the reason why learners may not succeed in Mathematics. (Peters 2013).

Educators are further advised to vary strategies of creating a positive teaching and learning environment which may include management styles or classroom displays, keeping in mind importance of balancing variety as lack of stimulus can lead to monotony, while too much variation may also lead to anxiety and chaos. Small modifications may bring about a change in the way learners behave during instruction time (Weinstein & Romano 2015). The statement suggests that learners and educators may not mind spending a considerable amount of time concentrating on mathematical issues if the environment is clean and inviting rather than in a dirty classroom.

Learners may know what attracts them and can be perceptive and imaginative. With this in mind, Mathematics educators should involve learners in designing classroom and creating a classroom duty rosters to ensure that the environment is pleasant for a positive climate. Weinstein and Romano (2015), stress that when planning, educators should leave some of the things purposely undone so as to solicit learners' ideas and opinions. In addition, educators are advised that such responsibility should be rotational, giving a fair contribution chance to all learners. Fair involvement of the Mathematics learners can bring about trust, which is necessary for the creation of a positive classroom climate that is relaxed, happy, friendly or cooperative (Kruger & Van Schalkwyk 2016).

The parent–teacher relationship may also be a crucial factor in ensuring a cooperative climate in a classroom. Parents are the providers of most materials used in the classes. Most physical materials needed for building and maintaining classrooms, furniture, books, and at times educator salaries. Parents, guardians and community can also help to an extent as they indirectly contribute to the effectiveness of classroom management for instance the School Governing Board involvement in disciplinary issues. In support, Kruger and Van Schalkwyk (2016), explain that involving parents may enhance higher academic results, better attendance, positive attitudes towards the educator as well as the subject, easier management of homework and more manageable disciplinary issues.

The type of teaching strategy may also influence the classroom climate. Peter (2013), explains that the teaching style may be another factor that contributes to classroom climate in that learners in learner-centred classroom climates tend to rate their abilities significantly higher, have higher expectations for success, and display more pride in their accomplishments. Furthermore, Peter (2013) proclaims that in learner-centred approaches, educators attempt to find the balance between caring and challenging by believing in their learners and helping them to achieve their academic goals.

Regardless of the nature of the classroom climate, an educator must be prepared and should always be utilising expert knowledge and skills, taking cognisance of the needs, feelings, aspirations and in addition attitudes or individual differences of learners when assisting them. It is hoped that, as a result, the learners themselves may fall back on their natural and positive elements which may in turn enable them to develop passion for Mathematics and respond positively to the educator's instruction (Smutny & Fremd 2011).

It is critical to have a warm, positive and friendly climate in order to attract the maximum possible attention from learners during instruction time. This will enable both the educator and learner to express themselves and participate actively during the period. A Mathematics educator should therefore employ the relevant management style in order to enhance a climate conducive to effective classroom management.

2.5 CONCLUSION: THEORETICAL POSITIONING

This literature review addresses the research questions from two angles. Firstly, as Stols et al (2015) maintain that in order to be an effective unit of management, it is obligatory for educators to take cognisance of the environment, the availability of resources and of values, needs and interpersonal relationships in classrooms. Secondly, the importance of managing Mathematics classrooms effectually is crucial yet challenging for teachers, since it requires the ability to plan, organise and direct classroom matters systematically in addition to pedagogical competence (Akin et al. (2016). With these angles as point of departure it was noted in the literature review that considerable theorising has been conducted in the broad field of educational leadership and management in the last decade (Bush, 2007; Sahin, 2015). This thinking has also been applied to classroom management by Emmer and Sabornie (2014), and Kruger and Van Schalkwyk (2016) by highlighting autocratic management, democratic management and permissive management, as styles or approaches to be used. Biza et al. (2015) similarly applied these emphases to management in Mathematics classrooms. This chapter was in conclusion based on investigating and applying the management of Mathematics in classrooms with the three styles as foundation. The chapter was conceptually expanded by investigating the functioning of effective classroom management in schools, the components of classroom management and classroom administration as key areas to eventually deal with the main aim of the study namely, to explore the place and role of effective classroom management in the improvement of Mathematics education.

CHAPTER 3

RESEARCH DESIGN AND METHODOLOGY

3.1 INTRODUCTION

There are various research methods which may be utilised in a research study; the choice of a research method for this study was driven by the research questions, and instruments to be used in order to resolve the problem under study (Johnson & Onwuegbuzie 2004). The main research question of this investigation was to explore how effective classroom management of Mathematics relate to the improvement of Mathematics

education. The challenges and opinions of Mathematics HODs and other educator participants were explored. From the main research question, a number of sub-research questions transpired and were formulated as:

1 What are the challenges faced by educators in Mathematics classrooms?
2 What are the functions of classroom management in Mathematics classrooms?
3 Which classroom managerial skills can be applied to enhance performance in Mathematics?
4 Is educators' knowledge sufficient to provide and manage Mathematical instruction?
5 Which elements should be included in a model for effective classroom management?

Qualitative research was employed to provide answers to the research questions. The application of research methods in this study are highlighted under the following headings: research design and methodology, data collection methods, data analysis and interpretation, ethical considerations, rigour of the study, and conclusion.

3.2 RESEARCH DESIGN AND METHODOLOGY

3.2.1 Research design

Burns and Grove (2003, p. 195) define a research design as "a blueprint of conducting a study with maximum control over factors that may interfere with the validity of the findings". Similarly, Parahoo (1997, p. 142) describes a research design as 'a plan that describes how, when and where data

are to be collected and analysed.' Furthermore, Polit, Beck and Hungler (2001, p. 167) define a research design as 'the researcher's overall for answering the research question or testing the research hypothesis. The description of the research design posits that a given research design should explain the whole outline which is meant to answer research questions. The design methodologies of qualitative research are particularly robust when it comes to social validity, culminating in the involvement of participants (Kozleski 2017).

The aim of this part of the research study was to understand the educators' perspectives on the place and role of effective classroom management in the improvement of Mathematics education in Gauteng province. The researcher was conscious of the fact that research findings may not be generalised to a larger population (Creswell 2011). In addition, the researcher was also conscious of the fact that learners who attend the participating schools are from different economic backgrounds. In some schools, the Government introduced a feeding scheme whereby learners are given food as a basic human need and this is done to enable learners focus and put more attention on school activities. Additionally, learners from disadvantaged homes usually need to be treated in accordance with their living conditions in cases where they have for example not done their homework properly because they might not have access to some materials such as calculators or Mathematical sets.

A qualitative research design was selected for this study. The reasons for selecting this design was that it was viewed as the best approach to obtain detailed and first-hand information as experienced by educators. As such, the research design was best to suit the research study with the focus on the place and role of effective classroom management in Mathematics classrooms.

Lichtman (2010) describes qualitative research as research in which a researcher gathers, organises and interprets first-hand self-collected data through interviews and/or observations in natural and social settings. Furthermore, Burns and Grove (2003, p. 19) describe a qualitative approach as 'a systematic and subjective approach used to describe life experiences and situations to give meaning.' The notion is supported by Jin and Bridges (2016) who describe qualitative research as one which aims to capture the complexities and subtleties of human thoughts and behaviours by understanding the phenomenon of participants' interests.

Qualitative research focuses on the experiences of people as well as stressing the uniqueness of the individual (Parahoo 1997). Similarly, Holloway and Wheeler (2002, p. 30) refer to qualitative research as "a form of social enquiry that focuses on the way people interpret and make sense of their experience and the world in which they live". Kozleski (2017, p. 22) observes that 'qualitative methods make important contributions to achieving social validity.' In addition, Kozleski (2017), further expressed that qualitative research methods offer feedback loops that can provide information in enough depth and frequency that may enable school practitioners to shift, tune, and transform their practice in an attempt to improve learning through thick and rich descriptions of a given phenomenon.

Most qualitative research studies begin with an observation of an event or phenomenon under study. In this way, qualitative studies offer the opportunity to provide subtle details that outline a presenting problem (Ponterotto 2005). Literature reveals qualitative research as an approach that targets an audience's range of behaviour and the perceptions that drive it with reference to specific topics or issues. Kozleski (2017) explains that qualitative research is vital for an educational research study as it is empirical, stemming from experience and/or observation since it is capable of producing knowledge about perspectives, settings, and techniques thereby involving the systematic use of specific research skills and tools. Qualitative research studies therefore tend to utilise in-depth studies of individuals and small groups of people to guide and support the construction of hypotheses (Krauss 2005).

From another angle, qualitative research provides insights into the problem or helps to develop ideas or hypotheses for potential quantitative research (Kozleski, 2017). Furthermore, Kozleski (2017) alludes to the fact that qualitative research is also used to uncover trends in thought and opinions, and dives deeper into the problem. This enables exploration of how Mathematics educators were managing their teaching and learning settings and how this in turn affects Mathematics education.

Several unique aspects of qualitative research have been identified that contribute to rich, insightful results, one of which is synergy among participants as they build on each other's comments and ideas (Flemming 2014). As such, this research study employed the qualitative approach to explore the behaviour, perspectives, experiences, opinions and feelings of the targeted group of Mathematics educators and Mathematics HODs as

related parties in education. This was carried out in a qualitative manner through exploring the role that effective classroom management has in the improvement of Mathematics in Gauteng province.

3.2.2 Research methodology

The research methodology consists of the sampling procedure and data collection methods.

3.2.2.1 Sampling procedure

Johnson and Christensen (2013) emphasise the importance of using suitable sampling procedures when selecting participants to ensure the selection of a portion from the population as a representative of that population or universe. The researcher ensured that the sample selected was comprised of participants who are knowledgeable in the Mathematics subject and whose experience in managing their own Mathematics classes would provide dependable answers to the main research question.

According to Wyse (2011), in qualitative research the sample size is typically small. The researcher in this case focused on four schools in Gauteng province. Respondents were selected to fulfil a given quota. As such, the respondents had to be 24 participants consisting of Mathematics HODs and educators. In order to align the research to a qualitative approach, sampling procedures that are of qualitative nature were utilised. The researcher thus made use of purposive and convenience sampling. The researcher collected data from a total of 24 participants involving four Mathematics HODs and 20 Mathematics educators. The following table 3,1 indicates the educator qualifications.

Table 3.1: Participant Information

Gender	Participant code	Position	Age range	Subject of speciality	Subjects currently taught	Teaching experience (years)
Female	HA	HOD	40-49	Mathematics	Mathematics and Physical Education	25
Male	FGA1	Educator	40-49	Mathematics	Mathematics and Mathematical Literacy	26
Male	FGA2	Educator	40-49	Mathematics and Physical Sciences	Mathematical Literacy and Physical Sciences	4
Female	FGA3	Educator	20-29	Mathematical Literacy	Mathematics and Physical Sciences	4
Female	FGA4	Educator	40-49	Mathematics	Mathematics	21
Female	FGA5	Educator	20-29	Mathematics	Mathematics	6
Female	FGB1	Educator	30-39	Mathematics	Mathematics	3
Female	FGB2	Educator	30-39	Mathematics and Accounting	Mathematical Literacy and Accounting	11

Gender	Participant code	Position	Age range	Subject of speciality	Subjects currently taught	Teaching experience (years)
Male	FGB3	Educator	20-29	Mathematics and Business Studies	Mathematics	5
Male	FGB4	Educator	20-29	Mathematical Literacy	Mathematics and Mathematical Literacy	2
Female	FGB5	Educator	20-29	Geography and Mathematical Literacy	Mathematics and Mathematical Literacy	1
Female	FGB6	Educator	20-29	Mathematics and Life Orientation	Mathematics	1
Male	HC	HOD	40-49	Mathematics and Physical Sciences	Mathematics	17
Male	FGC1	Educator	40-49	Mathematics and Business Studies	Mathematics and Mathematical Literacy	10
Female	FGC4	Educator	40-49	Mathematics	Mathematics and Mathematical Literacy	22

Gender	Participant code	Position	Age range	Subject of speciality	Subjects currently taught	Teaching experience (years)
Male	FGC5	Educator	30-39	Mathematics and Mathematical Literacy	Mathematics and Mathematical Literacy	10
Female	FGC6	Educator	40-49	Mathematics and Mathematical Literacy	Mathematics and Mathematical Literacy	10
Male	HD	HOD	50-59	Mathematics and Life Sciences	Mathematics	25
Male	FGD1	Educator	50-59	Mathematics	Mathematics	10
Male	FGD2	Educator	30-39	Mathematics	Mathematics and Technology	1
Male	FGD3	Educator	20-29	Mathematics	Mathematical Literacy and Mathematics	2
Female	FGD4	Educator	50-59	Mathematics and Mathematical Literacy	Mathematics and Mathematical Literacy	10
Female	FGD5	Educator	40-49	Mathematics and Mathematical Literacy	Mathematical Literacy	17

3.2.2.1.1 Purposive sampling

Parahoo (1997, p. 232) describes purposive sampling as 'a method of sampling where the researcher deliberately chooses who to include in the study based on their ability to provide necessary data.' In support, Jacqueline and Barriors (2006) affirm that purposive sampling uses information-rich participants. This means that purposive sampling enabled the researcher to get reliable data as participants were expected to be knowledgeable. In addition, the researcher concentrated her effort to produce better quality research which is based on better instruments (Mashabela 2010).

Holloway and Wheeler (2002) assert that sample size does not influence the importance or quality of the study and note that there are no guidelines in determining sample size in qualitative research. Qualitative researchers do not normally know the number of people in the research beforehand; the sample may change in size and type during research. Sampling goes on until saturation has been achieved, in other words, until no new information is generated (Holloway and Wheeler 2002).

The researcher purposively selected participants from four schools in the Gauteng province to participate in the research. The schools purposively selected were from different locations in terms of socio-economic conditions. The researcher intended to explore the Mathematics views regardless of the location as long as it was a secondary school in Gauteng province. As such, out of the four schools selected, two schools are located in underprivileged area, the other one in a medium density while the fourth school is in a more privileged location. Purposive sampling was employed to enable feasibility in terms of getting information reform Mathematics HODs and educators regardless of age, experience or qualifications. De Vos, (2002, p. 207) describes purposive sampling as "a procedure based entirely on the judgement of the researcher." He adds that a sample is composed of elements that contain the most characteristics representative or typical attributes of the population, in this case Mathematics educators (De Vos, 2002, p. 207).

In this research study the researcher specifically utilised a smaller group to enable capturing of lived experiences and participants' interpretations of classroom management. The focus was on a single phenomenon which sought to explore the place and role of effective classroom management for the improvement of Mathematics education.

Challenges in utilising purposive sampling unfolded as the selection of a small size sample did not specifically resemble the population as assumed in quantitative research. Some Mathematics educators were regarded as suitable for inclusion as participants even though they were only qualified as Mathematical Literacy trained educators. This selection is in line with Parker (2010) who spelled out the educator qualification in South Africa as ranging from a teacher certificate, diploma certificate to bachelor degrees. This range of qualifications explain the level of speciality and not the subject speciality. Furthermore, research findings as shown in table 3.1 indicate that only four participants have 2 years or less experience as teachers. The researcher thus felt confident that the group of educators selected were suitable to be interviewed for this research study although there are probably not enough Mathematically qualified educators in some Gauteng High schools.

3.2.2.1.2 Convenience sampling

Petersen and Warbuton (2010) interpret convenience sampling as a method of choosing participants based on how easily available, they are. The main advantage of using convenience sampling was that it reduced financial and time challenges. As noted in Chapter 2, the researcher used Mathematics educators in Gauteng Province urban area where she resides and works. Data was conveniently collected locally without travelling long distances.

The following criteria were utilised to conveniently select participants:

1 Participants had to be available, free and willing to participate.
2 Participants had to be Mathematics high school educators regardless of gender, age or ethnicity.
3 Participants had to be working in Gauteng province.
4 Participants were to read and understand the participant information sheet and sign consent forms before any data was collected.

5 One Mathematics HOD as the supervisor of all Mathematics educators per participating school had to be interviewed face-to-face.
6 Five Mathematics educators per school were to participate in a focus group discussion as they were understood to have experience in managing Mathematics classrooms.

The researcher had to bear in mind Punch's (2009) observation that when utilising convenience sampling, the credibility of information attained during the research project could be questioned. As such, the researcher combined purposive and convenience sampling as an attempt to enhance credibility. However, one HOD failed to avail herself for the interview. Appointments were not easy to arrange. The researcher had to visit some participating schools several times in an attempt to secure and finalise appointments.

The findings therefore portray that a variety of data collection methods were employed as discussed in the next paragraph.

3.2.3 Data collection methods

Data collection is an important aspect of any research study. Unsuitable data collection methods can lead to invalid results (O'Leary 2004). The choice of data collection instruments is therefore critical. Qualitative data collection methods vary. The researcher utilised individual face to face semi-structured interviews, focus group discussions and limited observations for this investigation. The utilisation of multiple data collection instruments was meant to enhance trustworthiness and dependability of the research findings.

3.2.3.1 Interviews

An interview is a methodical data collection instrument that involves the interaction of two or more people with a common interest, thereby gaining knowledge or acquiring answers to the problem under study in a formal or non-formal setting as described by some writers (Kajornboon 2000). Cohen, Manion and Morrison (2000, p. 267) comment that 'the interview is not simply concerned with collecting data about life but it is life itself, in that its human embeddedness is inescapable.' In this research study, interviews involved conversations whereby the researcher and the

Mathematics HODs could pay attention to each other with a common view of answering research questions. Interviews can be structured, semi-structured or unstructured. In this study, the researcher selected semi-structured interviewing as the most appropriate to address the research questions. Some of the interview questions were similar to those of the focus group discussion. The utilisation of similar questions was meant to compare and validate responses from the focus group discussions which took place before interviews.

Memduhoğlu (2016) describes the semi-structured interview method as a data collection instrument where research questions are outlined and the roots of the research problem is explored by providing interviewees with semi-flexibility. Semi-structured interviews enable participants to express their views freely, giving the researcher opportunity to understand the participant's views and feelings, while at the same time enabling probing when necessary. Furthermore, semi-structured interviews allow researchers to flexibly collect personalised data by using both open-ended and closed-ended questions (Merriam & Tisdell 2015). An interview guide consisting of a list of questions was used by the researcher in order to remain focused on the main research questions (Gray 2004). The guiding questions which were utilised by the researcher are listed in Appendix F.

In this study, the semi-structured interviews empowered the researcher to collect data and gain knowledge in this case learning from the knowledge and experiences of other Mathematics educators and the Mathematics HODs regarding the management of their classes as recommended by Ersozlu and Cayci (2016). The researcher is of the opinion that the participants understand the requirements for a positive climate necessary for effective Mathematics lessons. (Ari et al, 2015. Kruger and Van Schalkwyk 2016, Etuk et al 2013, Stols et al 2015. During the interviews the researcher was respectful, non-judgemental and non-threatening. No issues involving sensitive areas such as race, religion, sex or politics were discussed. This enabled Mathematics HODs in participating schools to express their thoughts and feelings without hesitation.

An interview schedule was formulated to guide the researcher in conducting the data collection. Each of the Mathematics HODs from the four schools was selected for interviewing. Ten guiding questions were utilised to conduct the semi-structured face-to-face interviews (see Appendix F). Probing was used where possible in order to increase clarity on particular subjects during the discussions. During the data collection period, the researcher faced a challenge as one of the HOD participants failed to keep her appointment.

The next instrument utilised in collecting data was the focus group discussion, to be discussed in the next paragraph. All focus group discussions were carried out before the HOD interviews.

3.2.3.2 Focus group discussions

The researcher used four focus group discussions involving Mathematics teacher participants. Each focus group had five participants excluding the researcher. According to Mashabela (2010), a focus group discussion is a data collection technique that facilitates the requirement of a qualitative research methodology. Stalmeijer, Macnaughton and Van Mook (2014) further explain a focus group as an organised group discussion meant to collectively explore a specific set of crucial issues.

Focus group discussions were conducted after the normal teaching time with the idea to actively involve Mathematics educators as participants to explore their lived experiences in Mathematics education. The researcher expected to collect data from educators who were expected to be employing various strategies and management skills in ensuring a conducive environment for Mathematics teaching. (Kruger and Van Schalkwyk 2016;Smutny & Fremd 2011,Twemlow, Fonagy, Sacco and Brethour 2006, Peters 2013). During data collection one participant for example shared her experience of sending an ill- disciplined learner out of class and this related to what Seiz et al 2015 had pointed out on how some educators find classroom management as a huge challenge in providing instruction. Benefits of group discussions included a broader range of responses and elicitation of details that might otherwise have been overlooked. Focus group discussions allowed participants involved in the research to be probed further in a less formal way, as some participants could crack jokes as well as laughing during the discussions and thereby making it easy for other participants when answering questions. Furthermore, focus group discussions are perceived as a cost-effective and adaptable way of collecting large amounts of qualitative data in exchange for relatively little face-to-face researcher contact (Parker & Tritter 2006). In addition, they (Parker and Tritter, 2006) highlight that focus group discussion involves direct interaction between the researcher and a participant or group. It differs from traditional structured interviewing in several important ways, for instance that although the researcher may have some initial guiding questions or core concepts to ask about, there is no formal structured instrument or protocol. Questions on the attached observation guide were utilised as a

guide by the researcher and these questions were not formally structured. (See Appendix H). Secondly, the participants are free to move the conversation in any direction of interest that may arise as they ignite each other's thought patterns. Hence, questions could be randomly discussed. The challenge encountered was spending a lot more time on one question and less on other questions.

The researcher however had to be observant and diligent to ensure that the discussions remained non-sensitive and focused on answering the main research questions. Consequently, focus group discussions are particularly useful for exploring a topic broadly, as noted by Neuman (2000) who points out that focus group discussion may enable the researcher and participant an opportunity to clarify presented information which can be probed further in a less formal way. This made it easy for the Mathematics educators who act as participants to freely respond to questions by the researcher. The questions which were utilised to guide the focus group discussions appear in Appendix G of this thesis.

The focus group guiding questions enabled the researcher to address one of the recognised challenges of group interviews, namely that a focus group discussion may result in a long aimless conversation (Cohen et al. 2003). As a result, the researcher was able to optimise group forces and dynamics during the discussion (Nieuwenhuis 2010). In addition, the researcher could ensure that all participants shared their views in terms of the questions posed to them. Because only five educators per school participated, the researcher could rely on prompting and probing to ensure meaningful contributions by all participants (Nieuwenhuis 2010). The researcher also made use of recordings in capturing data whenever possible during the group discussions. De Vos, (2002) explain that recording enables the researcher to concentrate on what was said by the participants.

According to McMillan and Schumacher (2010), these focus group discussions if conducted effectively, result in the researcher obtaining a better understanding of a problem or an assessment of a problem, concern or idea. In this case, the researcher focused on finding out how the Mathematics educators are managing their Mathematics classes, thereby simultaneously discovering the place and role of effective classroom management in the improvement of Mathematics education. The focus group discussions enabled the collection of valuable data from a small sample but not sufficient enough to generalise what is happening in Gauteng province in relation to Mathematics teaching.

Possible challenges in using focus group discussion as a data collection technique included unconstructive dominance of some participants. At one school, a focus group participant was unnecessarily arguing for a long time, trying to justify why she exclude a disruptive learner out of class as a way to manage the misbehaviour. Responses of this nature did not reflect the feelings or experiences of all participants in the group. Another disadvantage as observed by the researcher during focus group discussions included side tracking of discussions to irrelevant issues and competition for dominance among the participants for example a prolonged discussion on how the ATP implementation is enforced. This discussion ended with a discussion on educator salaries. The researcher had to keep going back and forth pleading to move on and eventually managed to complete the data collection.

3.2.3.3 Observations

Kozleski (2017) explains observation as a data collection instrument which involves scrutinising other people and attempting to understand why they are doing something. Observation can be further clarified as the act of viewing someone's interactions with his or her surroundings. Bogdan and Biklen (2011) advise observers to concentrate and carry out more frequent but shorter observations first at entry, during the discussions, and then at exit. Bogdan and Biklen (2011) further suggest that an observer has to be passive, unobtrusive, friendly, show interest, honesty and find a common ground with participants without taking what is happening personally. In this research study the researcher did some observations concurrently with interviews and focus group discussions. Observations were made on the suitability of facilities, classroom management styles, the managing of grading and the ways in which educators communicate with each other as included in Appendix H, The researcher attempted to be a good listener, recording as much data as possible at the beginning, during the interviews and at the end of the discussions in the form of personal notes..

3.2.4 Data analysis and interpretation: thematic analysis

According to Anfara, Brown and Mangione (2002), the purpose of data analysis is to bring structure, meaning and order to the data. Data analysis in this study meant to organise, provide structure and elicit meaning from the research findings. Analysis of qualitative data is therefore relative to an active and interactive processing of collected data into detailed information. (Polit et al, 2001). According to Creswell (2009), qualitative researchers typically gather multiple forms of data such as interviews and observations rather than relying on a single data source. In this study, personal interviews, group interviews in the form of focus group discussions and limited observations were utilised for data collection as discussed in the previous section.

Braun and Clarke (2006) define thematic analysis as the process during which identifying, analysing, and reporting patterns and "themes" within qualitative data are established. Braun and Clarke (2006) add that thematic data analysis minimally organises and describes data set in a rich, detailed manner. Sgier (2012) describes thematic data analysis as one of the most common types of qualitative analysis that seeks to identify patterns which includes commonalities or contrasts in the contents of data collected. Also, Holloway and Todres (2003, p. 347) view 'thematising meanings' as one of a few shared generic skills across qualitative analysis. The researcher went through research notes and transcripts over and over again in order to understand and identify meanings emerging from the collected data. The researcher made connections between data by writing and utilising different colours to distinguish and relate responses, thereby establishing codes. The codes were then listed and related codes were combined to form sub-themes. Three sub-themes were combined to form a main theme and this resulted in four main themes emerging.

Thematic data analysis enabled this researcher to understand how the data from different sources were analysed. As indicated in the literature a series of well-defined steps such as category-building, coding and categorising were followed. The researcher reviewed the data collected from the interviews, focus group discussions and observations and grouped it according to emerging themes and categories. In this process common ideas where paraphrased from the transcribed conversations, focus groups and observations. Categories and themes were then designed by following

Creswell (2009) steps of data analysis which include familiarisation with the data, coding, searching for themes, defining and naming themes, and writing up.

The researcher familiarised herself with the data by listening attentively during the interviews and focus group discussions as well as repeatedly listening to the recordings, re-reading transcribed data and reviewing her written notes. This enabled her to understand and identify related and common responses. The researcher moved back and forth through the data sources to accommodate changes and additional data, and then to divide it into meaningful analytical units and codes. She then searched through the coded data for patterns in order to assign themes. Themes were identified by labelling and categorising the identified codes which corroborated with or contradicted one another. Finally, coded data were used to define and name themes which convincingly answered the main research questions.

3.3 ETHICAL CONSIDERATIONS

Jacobsen and Landau (2003) emphasise the importance of ethical considerations for research as they empower the study to be academically sound and relevant. Furthermore, Gray (2004) writes that participants should be informed of procedures, and risks involved in participating to enable them to freely give consent to the data collection procedure. The notion is supported by Creswell and Garrett (2008) who describes informed consent as a statement that participants are expected to read, before committing themselves to participate in a research, guaranteeing them certain rights. The researcher utilised a consent form which was freely completed by all participants. (See Appendix E)

This research involved adult participants who could make own decisions of whether and when and how to participate. Throughout the research, the researcher ensured that the data collection process was carried out consistently within the parameters of issues related race, religion, sex and politics. It is clear that the adult participants who participated in the study understood the importance of educational research and would provide honest responses. The researcher also ensured and maintained adherence to the professional code of conduct, national legislation and institutional guidelines as advised in the research ethics clearance certificate.

The process began when the researcher asked for permission to conduct research. Once given the approval, the researcher went on to request permission to carry out data collection process from the responsible authorities, namely the Gauteng DoE as well as from the principals of the schools.

After obtaining permission from the Gauteng DoE and the schools to collect data, the researcher obtained informed written consent from the participants (Mathematics HODs and Mathematics educators) prior to commencing with the actual data collection. For this purpose, the researcher ensured that research participants were informed of the nature and purpose of the study (Silverman 2010). During the process of obtaining informed consent, benefits and inconveniences associated with the data collection were explained before the signing of written commitment to participate. The researcher clearly described to participants how data was going to be collected, transcribed, categorised, presented, utilised and stored, thus enabling them to understand the process by issuing a detailed participant information sheet. Participants were informed that their names were not to be disclosed to anyone. Permission to audio-record interviews was sought prior to data collection. Confidentiality and anonymity were further handled as specified by Bryman (2004) who advises that in order to protect participants from harm, findings need to be published with discretion.

Interviews and focus group discussions were conducted outside school hours in an attempt to minimise participant inconvenience. Observations were carried out simultaneously during the focus group discussions and interviews. The researcher observed facilities such as containers improvised as classrooms, the lack of resources as evidenced by some worn out educator books in some Mathematics storerooms. The researcher assured participants that she would handle sensitive matters that relate to gender, politics, segregation and racial discrimination with discretion. Questions that were compiled based on the research questions were used for the interviews (see Appendix F) and focus group discussions (see Appendix G). The researcher probed further during the interviews and the group discussions in instances where clearer and deeper answers were needed. Permission to observe was also sought as participants were told that the researcher would record observations simultaneously with interviews and focus group discussions. The nature of observations conducted was explained in section 3.2.3.3

3.4 RIGOUR OF THE STUDY

Thomas and Magilvy (2011) purport that rigour is a vital component of establishing consistency of study methods, which also provides an accurate representation of the population under study. Crystallisation, trustworthiness, lack of harm to participants, and dependability were critical issues in this research study.

Crystallisation is a critical component of a research study. Creswell and Plano Clark (2006) recommend crystallisation as a method of bringing together complementary methods or data sources to offset the weaknesses in each other. The employment of multiple data collection instruments validated the research findings as obtained from the experiences as perceived and lived by the Mathematics educators. The multiple data collection enabled trustworthiness and credibility of the research findings (Krefting 1991). Shenton (2004) also recommends that researchers should ensure that their study measures or tests what is actually intended, in order to enhance credibility. As such, the researcher prepared in advance, guiding questions which led to a satisfactory research.

In addition, the researcher maintained the trust of the participants by not deceiving them and continually focusing on a sound relationship of trust with them. Apart from that, during the data analysis process, theme statements were developed into a valid story with literature interwoven into the findings.

In conducting the research study, the researcher ensured that no harm to participants would occur. The participants were informed about the whole process of data collection: later participants signed consent forms before the actual data collection process began. The researcher also ensured that all participants were aware of their right to withdraw from the research study at any given point, should they wish to do so. In addition, they were advised of the potential benefits of participating in the research, which included adding value to and forming part of existing knowledge systems, and serving as a theoretical knowledge base for sound decision-making, which could be extrapolated to Mathematics education.

Before concluding the research findings, the researcher held workshops at all participating schools in order to share as well as confirm research findings with the participants. The workshop was attended by all HODs including the one who had missed the interview and also most participants of the focus group discussions. No follow up interview was scheduled for HODs. Participants confirmation of research findings was sought in order to increase dependability. Participants agreed to the recording of proceedings, as such the four presentations of research findings were audio recorded. Transcripts from the interviews were not sent back to participants but the workshop was based on analysed data in the form of emerging themes. All participants for data collection who attended the workshop confirmed the findings as a correct record of data collected.

In qualitative research, dependability refers to the extent to which the findings of a study are consistent in terms of the research context (Creswell 2009). In striving for dependability, the researcher utilised Mathematics educators who are involved with the day-to-day management of Mathematics classrooms as participants. By so doing, the researcher was hoping to get findings which are truthful and trustworthy. The researcher utilised the observable behaviours of participants during the data collection process, the recordings and literature findings in order to get some meaning and reach a reliable and justified conclusion. This enabled the research findings to be cross-checked by peer educators in this case the participants who during the data collection process were in affirmative in most cases with each other's contributions., and also during the scheduled workshop meant to discuss research findings. The researcher also cross-checked findings by comparing data from different schools.

Member checking is explained as a controversial method to strengthen credibility of research findings. (Barusch, Gringeri & George 2011). In addition, Barusch et al, (2011) went on to indicate possible challenges associated with member checking such as when participants have widely different views about specific aspects. The researcher was aware of this weakness and attempted to act with discretion in the event of controversy.

However, in this study limitations such as the utilisation of a small sample, omission of sensitive areas, non-attendance of an HOD participant and inconsistency of educator qualification as well as teaching experience made it not possible to achieve an accurate representation of the Gauteng schools as the population in order to completely enhance rigour of the study.

3.5 CONCLUSION

In this chapter, the researcher discussed the ethical considerations, research design and methodological process of the study. The data collection and the methods employed for analysing and interpreting the data were also explained. The researcher also gave a detailed account of the ethical considerations and criteria adhered to in the study.

The researcher observed the participant pattern of communication before, during and after the data collection process. The general environment of the school, the physical facilities and its surroundings were also observed. Interviews and focus group discussions were audio-recorded and then transcribed. Data from observational scripts, transcripts of audio recordings and a few documents from schools such as the ATP, CAPS document, intervention forms and classroom rules were in some instances available to enhance the observations. The researcher could not get some intended documents such as minutes from meetings, record of marks, disciplinary records or lesson plans as participants did not feel comfortable to do so. Documentation was therefore minimally utilised for triangulation purposes.

In the following chapter, the main focus will be on presenting data, discussing the results and the research findings.

CHAPTER 4

RESEARCH FINDINGS: PRESENTATION AND DISCUSSION

4.1 INTRODUCTION

The qualitative research method was selected to collect and analyse data for this study, as mentioned in Chapter 1. The rationale for choosing a qualitative approach was explained in detail in the previous chapter. In using a qualitative approach, the researcher herself was the main tool used for collecting textual data, conducting interviews, guiding focus group discussions and carrying out limited observations. Interview questions were utilised as a basis for analysis in this chapter. (See Annexure F). The ethical considerations employed and the quality criteria adhered to have been explained throughout the research study. The researcher's emphasis was on ensuring credible, confirmable, dependable and authentic research findings. Before data collection, the researcher adhered to the ethical criterion as explained in the previous chapter. The researcher was able to obtain a Research Clearance Certificate from UNISA as well as a Research Approval letter from the Gauteng DBE. The two documents constitute the permission to conduct research in secondary schools in the Gauteng province.

The current chapter focuses on the analysis, representation and discussion of the data collected. The data was categorised into themes and sub-themes. Literature which is relevant to the research findings is discussed for justification purposes.

4.2 INFORMATION ABOUT PARTICIPANTS

Only Mathematics educators and Mathematics HODs were selected as participants. The researcher utilised codes in order to hide participants' identities. The codes can be interpreted as follows: H represents the Mathematics HOD. A, B, C and D represent school names, FG represents a focus group discussion participant, while numbers identify a particular participant per school. According to these criteria, FGA1 refers to the first focus group participant at school A, HB represents the HOD participant at school B respectively. The table below provides a summary of demographic and other details of the study participants. The demographic data indicates that participant age, qualification and experience are varied ranging from one year to twenty- six years. Sampling procedures took into account the teaching of Mathematics and not the age qualification, gender or experience of participants. A Mathematics HOD has the same qualification as a Mathematics educator but is assigned a leadership role. In most schools that were selected for data collection, the HOD is the most experienced educator. Furthermore, the demographic data shows all Mathematics educator participants are qualified and specialised in a specific subject area though a few qualified Mathematical Literacy educators are currently teaching Mathematics. In addition, most participants are shown to have more than 2 years of teaching experience and this increases the reliability of the research findings.

Table 4.1: Participant Information

School	Gender	Participant code	Position	Age range	Subject of speciality	Subjects currently taught	Teaching experience (years)	Nature of meeting	Date of meeting
A	Female	HA	HOD	40-49	Mathematics	Mathematics and Physical Education	25	Interview	07/03/2018

School	Gender	Participant code	Position	Age range	Subject of speciality	Subjects currently taught	Teaching experience (years)	Nature of meeting	Date of meeting
A	Male	FGA1	Educator	40-49	Mathematics	Mathematics and Mathematical Literacy	26	Focus Group Discussion	20/11/2017
A	Male	FGA2	Educator	40-49	Mathematics and Physical Sciences	Mathematical Literacy and Physical Sciences	4	Focus Group Discussion	20/11/2017
A	Female	FGA3	Educator	20-29	Mathematical Literacy	Mathematics and Physical Sciences	4	Focus Group Discussion	20/11/2017
A	Female	FGA4	Educator	40-49	Mathematics	Mathematics	21	Focus Group Discussion	20/11/2017
A	Female	FGA5	Educator	20-29	Mathematics	Mathematics	6	Focus Group Discussion	20/11/2017
B	Female	FGB1	Educator	30-39	Mathematics	Mathematics	3	Focus Group Discussion	7/12/2017
B	Female	FGB2	Educator	30-39	Mathematics and Accounting	Mathematical Literacy and Accounting	11	Focus Group Discussion	7/12/2017

School	Gender	Participant code	Position	Age range	Subject of speciality	Subjects currently taught	Teaching experience (years)	Nature of meeting	Date of meeting
B	Male	FGB3	Educator	20-29	Mathematics and Business Studies	Mathematics	5	Focus Group Discussion	7/12/2017
B	Male	FGB4	Educator	20-29	Mathematical Literacy	Mathematics and Mathematical Literacy	2	Focus Group Discussion	7/12/2017
B	Female	FGB5	Educator	20-29	Geography and Mathematical Literacy	Mathematics and Mathematical Literacy	1	Focus Group Discussion	7/12/2017
B	Female	FGB6	Educator	20-29	Mathematics and Life Orientation	Mathematics	1	Focus Group Discussion	7/12/2017
C	Male	HC	HOD	40-49	Mathematics and Physical Sciences	Mathematics	17	Interview	7/02/2018
C	Male	FGC1	Educator	40-49	Mathematics and Business Studies	Mathematics and Mathematical Literacy	10	Focus Group Discussion	7/02/2018
C	Female	FGC4	Educator	40-49	Mathematics	Mathematics and Mathematical Literacy	22	Focus Group Discussion	7/02/2018

School	Gender	Participant code	Position	Age range	Subject of speciality	Subjects currently taught	Teaching experience (years)	Nature of meeting	Date of meeting
C	Male	FGC5	Educator	30-39	Mathematics and Mathematical Literacy	Mathematics and Mathematical Literacy	10	Focus Group Discussion	7/02/2018
C	Female	FGC6	Educator	40-49	Mathematics and Mathematical Literacy	Mathematics and Mathematical Literacy	10	Focus Group Discussion	7/02/2018
D	Male	HD	HOD	50-59	Mathematics and Life Sciences	Mathematics	25	Interview	22/02/2018
D	Male	FGD1	Educator	50-59	Mathematics	Mathematics	10	Focus Group Discussion	22/02/2018
D	Male	FGD2	Educator	30-39	Mathematics	Mathematics and Technology	1	Focus Group Discussion	22/02/2018
D	Male	FGD3	Educator	20-29	Mathematics	Mathematical Literacy and Mathematics	2	Focus Group Discussion	22/02/2018
D	Female	FGD4	Educator	50-59	Mathematics and Mathematical Literacy	Mathematics and Mathematical Literacy	10	Focus Group Discussion	22/02/2018

School	Gender	Participant code	Position	Age range	Subject of speciality	Subjects currently taught	Teaching experience (years)	Nature of meeting	Date of meeting
D	Female	FGD5	Educator	40-49	Mathematics and Mathematical Literacy	Mathematical Literacy	17	Focus Group Discussion	22/02/2018

4.3 REALISATION OF THE ETHICAL MEASURES

After obtaining consent to carry out the current research study, data collection was undertaken at four secondary schools. The researcher conveniently selected schools that responded positively to her request to collect data. Initially, the researcher experienced challenges in obtaining permission to collect data in some schools. One of the schools who was not willing to give consent to data collection was excluded from the research. Permission to collect data at specific schools was granted by principals of schools A to D (see Appendix B)

On arrival at participating schools, the researcher met with participants and explained the aim of the research study. The researcher also explained the ethical considerations of the study including associated benefits and inconveniences. Participant permission to be audio-recorded was also requested (see Appendices C and D). In addition, the researcher explained how data was going to be transcribed, categorised, represented, analysed and stored. This was done in order to ensure that participants understood their rights before signing a consent form which also provided space for participants to write their personal details (see Appendix E). Sensitive areas of discussion were avoided throughout the research process; hence participation was completely risk-free. Participants were encouraged to freely share their perceptions and lived experiences. The researcher maintained the promised confidentiality during the entire research process. As explained in Chapter 3, the researcher employed semi-structured face-to-face interviews with the three head of departments. The fourth interview did not take place as the HOD failed to attend.

The table below shows a summary of interview schedules.

Table 4.2: Summary of Interview Schedules

School research code	Venue	Date	Scheduled duration	Duration
A	Classroom	07/03/2018	60 minutes	39 minutes
B		12/04/2018	60 minutes	Not Done
C	HOD's office	7/02/2018	60 minutes	43 minutes
D	HOD's office	22/02/2018	60 minutes	45 minutes

As mentioned earlier, data collection also involved Mathematics educators as participants of the focus group discussions, all of whom attended the groups as scheduled. At school B and school C, there were six participants instead of five per school. The researcher did not turn away anyone as their contributions were valued. The researcher utilised 14 guiding questions during the focus group discussion (see Appendix G).

Prior to receiving signed consent forms, the researcher had explained and requested participants to respect each other's contributions, and also to keep private the responses arising from the focus group discussions. However, at times during the discussions, the researcher observed that educators would disagree with each other, or would offer irrelevant responses. Such responses were not included during data analysis as research findings. Even though data collection was carried out after the normal teaching time in order to minimise inconveniences, two participants excused themselves during the discussion to attend to personal issues. The discussions were carried out as summarised in the table below. In order to collect sufficient data, the researcher participated as an observer.

Table 4.3: Summary of Focus Group Schedules

School code	Venue	Scheduled duration	Duration minutes	Number of Participants	Date
A	Staffroom	90 minutes	75	5 Educators	20/11/2017
B	Classroom	90 minutes	83	6 Educators	7/12/2017

C	Staffroom	90 minutes	80	6 Educators	7/02/2018
D	Classroom	90 minutes	81	5 Educators	22/02/2018

Interviews and focus group discussions were audio-recorded. The audiotapes were then transcribed. Data from the limited observations were also utilised for data analysis. The transcribed data was read over and over again in order to examine, compare and conceptualise the data. This enabled the researcher to identify meanings emerging from the transcripts and from research notes. The researcher made connections between data by writing and utilising different colours to distinguish and relate responses, thereby establishing codes. The codes were then listed and related codes were combined to form sub-themes. The entire data collected was thematically analysed.

The themes that emerged from the research findings were supported by the related literature review and demonstrated the importance of effective classroom management for the improvement of Mathematics education. The identified themes were as follows:

4.4 RESEARCH FINDINGS

During the data analysis four main themes emerged with each main theme comprising of three sub-themes as summarised in Table 4.4 below.

Table 4.4: Themes and Sub-Themes

THEME	**SUB-THEME**
Management styles in Mathematics classrooms	1. Autocratic style 2. Democratic style 3. Permissive style
Resources for the management of Mathematics classrooms	1. The educator as a classroom resource

	2. The technical and material resources 3. The physical resources
Management of classroom teaching	1. Teacher as professional 2. Grading and assessment 3. Grouping
Management of classroom skills	1. Time management 2. Classroom discipline 3. Motivation

4.4.1 Theme 1: Management styles in Mathematics classrooms

The different theoretical conceptualisations of classroom management styles were highlighted in section 2.3 of this thesis. An *autocratic style* was associated with a teacher-controlled classroom with very little learner participation whereas a *democratic style* is depicted as a style in which educators are viewed as leaders who collaborate with learners in developing classroom activities and rules together. The *permissive management style* is described as an approach which enables an educator to provide a lot of warmth and affection as learners are free to decide what they want to do. Hence theme 1 was mainly responded to the research question, "Which managerial skills can be employed in Mathematics classrooms", As such, the three styles emerged as the classroom management styles in Mathematics classrooms as sub-themes.

4.4.1.1 Autocratic leadership style

One of the major findings of the study is that educators are serious about the fact that they are managers of their own classrooms. In response to the research question, "Which managerial skills can be employed in Mathematics classrooms", The responses by participants included, "Every class teacher is a manager, therefore each and every teacher must have her own rules to more or less monitor the class that she teaches" (FGD3, p. 16). The analysis showed that teachers employ the autocratic management style where classes are too big and learner contributions minimal. During the data collection one participant said:

> One of my classes has 65 learners so, most of the time I am the one talking and giving instructions, there is very little time for group discussion. My lecture way of teaching is probably autocratic. (FGB2, p8).

In support, another participant added that, limited classroom space and shortage of facilities can also lead to autocratic management in classrooms (FGD2, p5). In such a case educator focus on curriculum coverage at the expense of improvement in Mathematics education.

Normally we get the syllabi from the DoE or from the district and as if they are the ones who are going to set the paper, but to some extent I'm facing challenges as well, because the school knows these learners better than anyone else (HA, p6-7).

Another participant shared his experiences and said:

> Mathematics policies are governed by the school rules, and they are also governed by the policy of the department in terms of maths and generally the department. Like I will start with the issue of timetabling for example. We follow what the department is saying, the waiting, it also influences the timetable, how many periods do we have to have per week. So that is the policy of the Department of Education, so we also implement that (HC, p8).

Research findings show that the autocratic teaching style is also used when learners are punished for not completing their assigned work in time. For instance, FGC4 (p17) said, "at times I even get support from the deputy principals; learners are punished for not doing their work". During a focus group discussion, a participant shared her experience of dealing with unruly behaviour: "Ja, I once chased almost the whole class out, like eighty per cent of the class" (FGD5 p17). The views and actions mentioned in this paragraph coincide with literature findings where educators are reminded of one of their most important managerial responsibilities for being in charge of the learners, activities, furniture and everything allocated to specific classrooms, where teaching–learning is expected to take place (Nieuwoudt 2015). As mentioned by Allen (2010), autocratic leadership should however probably only be employed temporarily in the classroom, and in cases of extreme undisciplined behaviour. In relation to this autocratic way of having work done, Ari et al. (2015) stress that the autocratic leadership style is mostly employed in traditional classrooms where learners are passive participants, while goals are achieved through reward and punishment.

The autocratic management style can be used by educators in situations where disciplining learners is critically important. It is recommended that disruptive learner behaviour could even

be solved by giving rewards. A learner who is disruptive in class can start to behave well in anticipation of receiving a reward. A Mathematics educator can even get support of the HOD in order to maintain order in classroom. Parental involvement can also be called for in case of continuous lesson disruptions. Learners may receive stickers, certificates or simply applauding for improved behaviour. To a degree teacher's affinity for autocratic management is also determined by the prescriptive nature of the teaching profession as evident by the existence of the Annual Teaching Plan (ATP). Educators may argue that since the teaching plan instructs them in detail what and when a Mathematics concept or topic is to be taught (Appendix I), they are also entitled to manage their classrooms in an autocratic way. The researcher understands that although the ATP is a detailed plan which shows what should be taught over a specific period of time it does not impose or spell out what strategies are to be utilised during implementation. Educators have the important function to decide what work is to be done in a particular lesson and importantly to decide how to manage their classrooms effectively. Although aspects of autocratic management are clearly visible in classroom management manifestations of participative or democratic management are evident in classroom management.

Hence, it seems as though some educators in Gauteng province are employing autocratic styles as a way of ensuring completion of tasks and to instil discipline in their classrooms. The fact that educators are apparently serious about being managers of their own classrooms is also an indication that they have strong tendencies for autocratic management in the classroom.

4.4.1.2 Democratic style

The democratic management style accommodates learner participation in classrooms. Participants agreed to the fact that they involve learners in day to day classroom activities and in drafting classroom rules (FGB4; FGC1). This means that in spite of what was found with regard to autocratic management in the previous section educators do also apply democratic management in their classrooms under certain conditions. In fact, most of the participants favoured the idea of democratic management in their classrooms. (FGB2; FGC1).

Furthermore, FGC1, (p16) said, "Ja, when you are friendly and you go to them, then they can see that the teacher cares about them, you know, unlike when you just take and you move on with the two that understand". In addition, FGB4 (p28) supported this comment saying: "-- and educators have a strong personality, to accommodate and be patient". Also, FGB2 (p28) added, a view: "Bad behaviour can be managed by being friendly and approachable" whereas FGA2

(p16) remarked" some learners' behaviour resulting from their family or home background is valued". In such a scenario, one would for example supervise a learner's homework or even assist him/her with homework as a display of kindness.

Participants remarked in this regard that the social conditions of learners from deprived homes meant that they more readily accepted autocratically managed classrooms than those from well-off backgrounds.

FGD3 (p11) made another important point when he explained that the style of classroom management in Mathematics cannot be isolated from the overall culture of the school.

> If the school is dysfunctional (and mainly use autocratic management), it's going to be difficult to just use democratic management in Mathematics classrooms. The overall culture of the school is going to creep into all the things. So, you cannot look at it in isolation, the school must be well managed and then it would be easy to manage classrooms well.

In support, another participant (FGD5, p11). added

> A good number of our learners come from poor homes, some come from parents who are abusive, some parents are not in a position to assist their children, and some come from extreme poverty, so basically there's environmental problems which play a greater role in achievement of good results in Mathematics.

Stols et al. (2015) mention that a learner-centred (or democratic) approach in classroom management is widely followed by South African educators and is also recommended as the best approach by the DBE. The idea of democratic classroom management is supported by Kruger and Van Schalkwyk (2016) who stress that good interpersonal relationships in the classroom enhance cooperation, trust, teamwork, and active participation by all parties to achieve effective learning.

The researcher's view is that the democratic management style tends to align itself with educators' characteristics such as being accommodative, approachable, committed and knowledgeable. The democratic leadership style should in any case be applied as required by particular situations. Teachers are supposed to be knowledgeable and flexible and know how and when to use different leadership styles. The teaching of different classes or different topics could determine the leadership style for the situation.

4.4.1.3 Permissive leadership style

The permissive management style can be viewed as a strategy in which learners are actively involved, while the educator is passive. The style is least employed by Mathematics educators since it does not involve a lot of educator intervention. As such, some learners abuse the employment of the management style by not focusing on given tasks. If learners are not closely monitored in a Mathematics class, several unwanted behaviours emerge such as playing on cell phones, or chatting. The research findings indicate that some participants tend to employ the permissive leadership style together with other styles such as democratic management. It is however not really practical to use the permissive style "since learners can easily turn classrooms into social media platforms" (FGC5 (p7). Another participant (FGC 4) indicated that applying this style could easily lead to classroom work being neglected and learners becoming unruly.

Related literature indicates that permissive classroom management style in Mathematics classrooms is non-productive (Sahin 2015). Other sources (see section 2.3.2) however, indicate that this approach can be seen as a way that an educator can give passive learners an opportunity to express themselves.

The researcher views the implementation of the permissive management style as minimal. It could perhaps work in situations where an educator is very experienced and have a sound knowledge of the subject. In such a situation the educator might feel that learners who have little self-confidence could be encouraged to participate more freely by applying this style.

The composite findings of this section indicate that some Mathematics educators seem to not understand clearly when to employ the different styles. However, the democratic style was the most preferred style for classroom management in Mathematics classrooms because of the active participation of learners and educators. Educators should thus be encouraged to employ leadership styles that are in accordance with the Mathematics task to be carried out and intended goals to be achieved.

4.4.2 Theme 2: Resources for the management of Mathematics classrooms

Responses in this section sought to answer the research question on challenges faced by educators when managing Mathematics classrooms. Previously in section 2.4.1, the researcher defined effective classroom management as a process of establishing, maintaining, and

restoring the classroom environment in an operative way for teaching and learning (Akin et al. 2016). It is known that to carry out any process, inputs are needed. As such, resources are critical inputs for effective classroom management. Research findings show that there are varied resources for the management of Mathematics classrooms. Such resources include availability of physical resources, technical material, and also educators as resources. In answering the research question on challenges faced by educators when managing their classrooms, the different kind of resources identified and are discussed further on sections which follow.

4.4.2.1 The educator as a resource

The educator is expected to possess particular characteristics to be able to teach and manage effectively as a resource person in the classroom. The study findings confirm that educators receive support from schools and fellow educators to enable them become resourceful HD (p9) commented:

> The support is good, [is nice], because we are able to use the school webmail, to use the school work email for downloading; we are able to do the photocopies, you don't pay any cent, they are just helping.

The researcher observed at one school that, the school had provided them with overhead projectors and Power Point. During the interviews and group discussions, it was clearly shown that educators are regarded as human resources with unique characteristics which are ideal for teaching Mathematics. This emanates from the fact that many tasks can occur simultaneously, requiring appropriate monitoring, knowledge, preparedness, flexibility, punctuality and other management skills (see also Kruger and Van Schalkwyk, 2016).

FGC1 (p20) said, "And preparation also, you've got to prepare before you go to class because even if you think you know what you know, in Mathematics you must prepare". However, contributions from some of the participants demonstrated that not all Mathematics educators possess all the qualities of being a "resource person" in the strictest sense of the word. This was evidenced by a participant who confessed her belief that "most of the learners here are very angry and look threatening, so much that I become scared to ask them or even assist them. They don't seem to value education at all" (FGD4, p12).

FGD3 (p10) encouraged Mathematics educators, saying, "I think we should just make a positive difference, learners that are manageable or that are ill-disciplined". With this

statement, the participant touched on the ever-present disciplinary problems that Mathematics teachers experience in their classes. FGC4 (p15) shared her experience:

> At times I use one-on-one, I go to their desks, I sit with them, we discuss while others are busy with whatever that we're doing in class. In that way I see most learners they become interested because they see that the teacher is available, helpful and interested.

In this regard, Etuk et al. (2013) suggest that educators should have extra responsibility in being innovative, and employing variety in their instructional delivery to keep their learners always alert and prepared to react positively and learn. Mathematics educators are therefore reminded to draft lesson plans in a very structured format and implement them as prescribed by syllabi in this case the CAPS as interpreted in the ATP. Structured lesson plans can be enhanced by making use of the necessary technical and material resources to enable achievement of the lesson objectives which in turn fulfil the expectations as instructed in the prescribed tasks.

The researcher noticed from the participant demographic data that some schools did not have enough qualified Mathematics educators. Such schools were allocating Mathematics classes to educators trained to teach Mathematical Literacy (Table 4.1). Mathematics educators must realise that good interpersonal relationships in their Mathematics classrooms are mainly constructed based on various factors such as their own abilities and characteristics as well as confidence which can be enhanced by possessing the necessary qualification. Furthermore, a Mathematics educator as a resource should ensure a balance between learner needs and meeting the curriculum requirements, in this case as pronounced in the CAPS document, as well as implementing the Gauteng ATP which can only be effectively carried out by a qualified educator specialised in the teaching of the subject. As such, an effective Mathematics educator as a resource should possess a rich knowledge of the Mathematics subject, confident in instruction provision, friendly and accommodative, vary management styles and teaching methods according to the lesson objectives and the prevailing climate. Being patient and a good communicator, encouraging and always involving learners are some of the basic and expected characteristics of an effective Mathematics educator.

4.4.2.2 Technical and material resources in Mathematics classrooms

Technical and material resources incorporate all the necessary tools which educators need to effectively provide instruction and manage their classrooms. In one of the HOD offices which was used as interview venue, the researcher observed worn out educator reference books

indicating poor resource availability. Some schools which had PowerPoint in some classrooms did not provide laptops for educators. Resources in these cases were both insufficient while in some cases under-utilised. In all schools in Gauteng, the DBE provides textbooks and at times charts, as well as feeding schemes in some disadvantaged schools. FGA2 (p18) confirmed that "the school provides food, furniture books and teaching-related things". FGD5 (p3) observed that "there are no computers as such, but when you are teaching on the smart board, it is very useful". It appears that smart boards have been well received. Some participants indicated that private companies had donated a few smart boards to some disadvantaged schools and that additional support services were being rendered whereby a technician visits the schools once or twice a week. FGB4 (p5) explained:

> We had the whole wi-fi system and in the wi-fi they had all the boys. They'd go to a shared network and that network then you link to like on a quiz base, and the quiz is all about Mathematics and what they are doing, then every child that is on there, you can see if they've got it wrong or right unlike going through question by question discussing, but this one becomes almost like a competition whose feedback is there, and then, and then it records the results and so when you go back to it, it keeps the score of the child. So, for this assignment you got this and this assignment you got this and then it tells you exactly where they went wrong or right.

In this regard, another participant added,

> We have smart boards, what is nice with smart boards is that you have a lab, laboratory, does it include computer? Sometimes you explain certain concepts,

they have nice videos that you can just play for them in the smart board, and leaners are able

> to understand better (FGA5, p9).

However, most schools cannot afford the advanced technology. There are very few classes per school that have the usage of smart boards (HC, p9). However, it was commonly stated that schools were rendering support in terms of stationery, textbooks for learners and additional reference books for educators. The researcher observed and noted that some classes had mathematical geometry sets, and charts were displayed on the walls of one Mathematics classroom. Before concluding the research findings, the research held workshops at all participating schools in order to share the findings and confirm with the participants.

During a focus group discussion, FGD2 (p6) commented on classroom overcrowding: "Yes, there are too many learners so chairs and desks are everywhere. Two learners share a desk". The researcher confirmed by observing lots of chairs and desks in a small classroom during a focus group discussion as earlier pointed out. The situation is well-supported by related literature which stresses that the educator has a very important responsibility for human and non-human elements allocated to specific classrooms where teaching–learning is expected to take place (Nieuwoudt 2015). Mirza and Iqbal (2014) also say,

> In general, Mathematics teachers teach from textbooks without relating the concepts to daily life experiences and they start lessons by dictating formulae and asking students to memorise those formulae in order to solve the questions.

In this study, the statement by Mirza and Iqbal (2014), must be seen in the light of the fact that, as shown in the research findings, a number of schools in Gauteng province utilise audio-visual aids and technology equipment like smart boards and PowerPoint programmes which are electrically designed to project what is in the computer or laptop in an attempt to relate mathematical concepts to real-life situations. The Power point enables the educator to show images, videos and demonstrations of activities much faster and accurately whereas the smartboard is an interactive whiteboard which utilises the touch screen application in addition to the keyboard or the mouse system. Smart boards enable the Mathematics educators to manipulate anything on the screen with fingers. Furthermore, research findings indicate that the use of technically advanced IT laboratories or smart boards for Mathematics classrooms assist learners in quickly understanding mathematical concepts, as opposed to the educator explaining and illustrating on the chalkboard. Even though there are technicians that visit schools and service as well as maintain equipment in this case smart boards, it is still largely the educator's responsibility to ensure that such resources are well taken care of and effectively utilised.

4.4.2.3 Availability of physical resources for teaching Mathematics

In this research, the main "physical facility" is the Mathematics classroom in which teaching and learning takes place. One participant said, "Classroom maintenance is done by the school" (FGA1, p18). Another participant was complaining and expressed his frustration about the lack of availability of physical facilities saying:

> This one is a challenge because in our school we don't have a class that is designed for maths. We have a class that is designed for all subjects, they use the same class

> and our classes are not equipped, in a classroom, is a desk, a chair and a board (HC, p5).

A number of participants shared these sentiments concerning insufficient learning space and overcrowded classrooms. FGD4 (p4) and HC (p6) confirmed that they have 60 to 80 learners per class. HC (p6) said,

> As for the class size is a great challenge, as we speak right now we having a meeting, where we want to do what we call a platoon, grade ten to eleven they will attend, it means that you're going to have two schools, that will start at different times, because of the issue of the size of the classes. Our classes are packed, ja, like the other class which is ten-A, there are sixty learners who are doing maths and the other one I think is also sixty-nine learners who are doing maths. So, it's crowded, is not conducive especially for maths, when you have to pay individual attention to learners. So, what we are trying to do is to do part two where we will have grade eight and nine who will come later during the day, and then ten to twelve, they will start in the morning and knock off around one o'clock, so we see what to do, so that we can be able to divide the class into a smaller class.

Another participant shared his experiences:

> Provision of resources, enough resources to the classroom practitioners, and I also urge teachers to be knowledgeable, to read ahead of the learner, especially when you are teaching Matric or even Grade 8, because the way you present your information to the learners most determines whether is going to be distinction student or not, if you don't know what you're doing exactly, the child is going to be killed right from the onset and you won't remedy that (HA, p10).

Related literature suggests that a classroom in its physical nature provides emotional, physical security and shelter (Akın et al 2016). Heyd-Metzuyanim and Graven, (2016) views a classroom as more than just an environmental setting or place of learning associated with multiple activities. For a classroom to be an effective unit of management, it is obligatory to take into cognisance the environment, availability of resources, values/needs and interpersonal relationships (Stols et al 2015).

As evidenced by research findings, classes in some Gauteng schools are overcrowded. Overcrowding is a challenge for Mathematics educators. Maintenance of discipline and physical resources cannot be effectively carried out. Learners sharing chairs or desks pose a huge challenge in terms of homework, individual or group work activities and supervision.

Furthermore, effective invigilation of assessments or individual remediation during classes is yet another huge challenge. In a Mathematics classroom in particular, multiple activities are carried out, including educators giving instructions, learners listening, participating as a whole class, groups or as individuals listening attentively and at times not even paying attention as expected by the educator, doing classwork, participating in evaluation procedures, keeping records, checking workbooks, learner–educator interactions and group discussions.

However, some schools have plans to address the overcrowding issues such as the platoon system (as explained above by HC, p6). Most schools do not have sufficient technical or material resources apart from the main textbooks provided by the DBE. Such challenges for instance overcrowding do not enhance sufficient emotional and security aspects to necessitate effective management of classroom teaching. Mathematics educators were appreciative of smart boards, as most learners focus more readily on these than on normal chalkboards. The researcher observed that Mathematics educators provide worksheets, assessment tasks, create intervention programmes, homework cards and general classroom environments conducive to teaching and learning. The provision of such requirements qualifies a Mathematics educator as a critical resource.

However, most schools in Gauteng do not have sufficient physical resources. Mathematics educators are not coping with the large classes they are currently teaching. There is no space to walk about checking learners' work in most schools. Learners are sharing furniture which makes it very difficult to manage such classes effectively. Some Mathematics educators are not adequately knowledgeable or skilled to manage Mathematics classes. Such shortcomings result in Mathematics educators struggling to perform duties efficiently as a "resource person". The DBE is to be commended for ensuring that all schools have Mathematics educators, textbooks and other resources, as well as meal provision for disadvantaged learners.

4.4.3 Theme 3: The managing of classroom teaching

Theme 3 sought to answer the research question on functions of classroom management. At the beginning of the focus group discussions, the researcher observed that teachers involved themselves in discussions on the "teaching skills and abilities" of Mathematics teachers and whether "good teachers are made or born". The researcher regarded some of these discussions as so-called ice-breakers, but directed the discussions towards focusing clearly on the *managing* of teaching and not on teaching methods per se. With this focus in mind, the

following three sub-themes were extracted from the findings to explain the views of the participants combined with the researcher's own observations on the managing of classroom teaching. The first sub-theme is *the teacher as professional.* The second sub-theme concerns *grading and assessment in the classroom* and the third is *group work.*

4.4.3.1 The educator as a professional

The professional nature of the teaching profession is closely linked to the specialised skills and competences that teachers acquire during their training from acknowledged institutions (Hanekom & Thornhill 1986). A Mathematics educator as a professional should be presentable, passionate, value-or results-driven and principled. Research findings indicate that participants agreed that educators should be held in high esteem by the community and therefore need to keep updating their knowledge base. One of the participants who had an open-minded approach to improving Mathematics teaching, said,

> Most Mathematics educators have a learners' interest at heart and understand their circumstances and should therefore be able to use the discovery teaching approach whereby learners can become eager to explore and discover new concepts themselves (FGC4, p14).

Other participants (FGC6, p15; FGC1, p15) agreed with the utilisation of the discovery method. Another educator participant said, "With this kind of teacher attitude, Mathematics educators will show that they are more dedicated to their work compared to educators for other subjects" (FGD5, p26).

Participants however stressed two challenges of their situation compellingly. The first shortcoming noted was that they have insufficient mathematical knowledge of some concepts, for instance geometry. In this regard an HOD participant said,

> If maybe they can categorise teachers in a sense of their strength, not basically a teacher having to teach algebra, geometry and teach everything you see, because every teacher has got his own strong points and many educators struggle with geometry (HD, p9).

Furthermore, it was mentioned that most teacher workshops exclude geometry sections and this creates a widening gap between the two main subject areas (HD, p10). In this regard, the participant HD in particular, expressed a desire for a reorganisation of the Mathematics curriculum because some teachers lack knowledge in the area of geometry. The other shortcoming emphasised was the insufficiency of technical equipment and physical facilities.

For instance, FGC2 (p4) complained: “Well in our case we don’t have computer labs and it’s not all the learners who have the opportunity to have or to get the smart board classrooms”. As such, the research findings indicated that most classes are not designed for Mathematics and furthermore, not all classes have smart boards or PowerPoints and there are no mathematically designed laboratories. The statement is supported by (FGD3, p3) who said, “some learners have their own tablets and smart phones, we don’t do the computer work, and smart board is the relative to computer in our case”. Another HOD added,

> So, for now our classes are difficult to manage. Classes are too big and we don’t have a PA system to speak louder for everyone to hear and we don’t have enough resources like math sets, we can’t manage them except the grade twelve, where they are fewer in class, but grade eight to eleven, one class in grade eleven, I think they are eighty-something, you can’t teach that kind of a class (HC, p5).

Mirza and Iqbal (2014) determine that there is a widening gap between what learners know and what they should know. Furthermore, related literature shows that effective teaching and learning only takes place when there are skilled educators who are experienced, dedicated, responsible and knowledgeable enough to ensure success (Grapragasem et al. 2015). Such characteristics define educators as professionals. In harmony with the related literature and research findings, the researcher agrees that in Mathematics classrooms, educators need to be professional so as to be effectively and sufficiently ready to provide instruction in a classroom climate conducive to teaching and learning. In the absence of Mathematics laboratories, a Mathematics educator, as a professional, should ensure that classrooms are sufficiently furnished and display mathematical charts and other teaching–learning aids such as construction sets or measurement equipment. Mathematics educators should be professionally dressed, skilled, knowledgeable, and display sound educator characteristics. In the researcher’s experience and during research study observation, the class sizes must be reasonably large. Class sizes of about 20:1 in terms of learner to teacher ratio enable the educator to assist learners individually and effectively. The shortcomings mentioned are hindering Mathematics educators in some Gauteng schools from effectively managing their classrooms in a professionally resourceful way.

4.4.3.2 Grading and assessment

It was found that it is essential for Mathematics educators to have grading and assessment skills. Grading and assessment encompass the role played by educators in the application of standard measurement levels in relation to Mathematics assessments. Research findings

demonstrated that Mathematics educators implement a curriculum as prescribed in the ATP provided by Gauteng DBE. An example from FGD5 (p9) was given where, in Grade 10, first term learners must have completed two formal assessments. The formal assessments are expected to be graded out of fifty. It is important to note that the DoE sets midyear and end-of-year examinations. The research findings indicated that external assessments play a vital role in classroom management as they set a national standard and also require an educator to complete all topics as expected by the Gauteng DBE (FGA2, p20). An HOD participant discussed his opinion of internal and external assessments:

> They both works, look both assessments work such that, the local one makes teachers to relax a bit when it comes to syllabus coverage because they think they will just concentrate on the topics they feel comfortable in, but an external one will push a teacher to the limit of going an extra mile in teaching his learners, so as to finish the syllabus also. But I prefer the external ones (HD p7)**.**

Another participant explained his experience of grading classroom activities:

> Activities are being graded, you start from simple, little by little to challenging, then more challenging. So, in class when you do an activity you don't say do one, and then when stop on the finished one you say do two, no. The brighter learner must move to questions two, three, four, five and so on. So you say okay let me check you are done, move to two, you are done you park, move to three, so that is how you manage the grading in class. Those who are slow learners, when others are doing number eight, they will still be in number two or three, then you assist them. You move slowly with them, that is how I teach (FGC5, p10).

During one of the interviews, one participant said,

> ----after the one or two assessments, that is informal tests, you normally encourage them or you just instruct them to sit accordingly, that is those who passed have to sit with those who are not doing well, so as to help each other and to encourage teamwork (HD, p3).

Some participants portrayed that many informal assessments are done to prepare learners for the formal assessments (FGC2, p23; FGC4, p23). However, setbacks relating to grading and assessments as observed by the researcher were in supervising assessments emanating from lack of sufficient learning space, lack of work ethic, insufficient parental support, insufficient material resources and disciplinary problems. Research findings also demonstrated that some learners' participation and performance in assessments could be hindered by social problems

or lack of parental support in enhancing the child's environment to do school work such as homework or preparing for assessments. This is evidenced by the participants who also noted that educators should consider learners' social academic background since these differed widely. The majority of learners from schools C and D, for example, came from difficult and poor homes.

FGD5 (p11) offered an example of learner participation or completion of tasks being hindered by the social environment:

> Ja, because I think that we should also take into consideration the social background and so forth, because a learner can come homework not done because of no electricity, or maybe there is a problem at home and that problem affected the learner. Such a learner comes to class, you want to try and teach and make him focus into what you're doing but already the learner could be drunk or something and is not easy to manage.

In this regard, HD (p8) stated:

> Yes, the departmental policy like in Mathematics, they have these kinds of pass requirement, is not similar to others like when you talk of General Education and Training (GET) which in this case Grade 8 and Grade 9 phase, is at forty per cent and when you talk of Further Education Training (FET), it has been reduced to thirty per cent, but all in all, the maths policy, it more or less helps the learner to think beyond, is not stagnant.

One HOD said,

> You give them a class activity that they should do, so then what you do as a teacher is to move around, checking whether the learners are doing the right thing. So, after that it means that as a teacher you will be sure whether what you have explained learners have absorbed it. So, if you find that most learners are still struggling to do that activity, it means that you go back and do teaching again, right you will redo the teaching, then you give them further activities. But because in class there are different levels of learners, those who understand very quickly, those who are in the middle, and those who are average. So, which means that when you are re-explaining that the higher achievers, you give them other work to proceed" (HC, p1–2).

Along the same line of thinking, FGD4 (p7) recommended that assessments must include all levels of difficulty to cater for both the slow and high achievers as they write the same assessment. He commented:

> That one is tough, what you need to do to make sure that they all understand yet they are of different levels of ability. Some of them are smart and others are not, yet they are going to write the same paper. It is a challenge, I most of the time just teach everyone then assess by giving different levels of questions but the problem is still that all of them are going to write the same paper.

In support, FGD1 (p7) explained:

> What I do is that for the others who are not, well, bright, I make them sit separate from the ones that are struggling. I then give those struggling more attention and less work so as to catch up while brighter learners are busy with different questions because some who are bright will keep on doing work without much supervision. If I give them the same easy questions, they get bored as I try to cover the ones that are not good. So, with me giving different questions is how I manage the two while still balancing.

Related literature recommends that workshops or staff development programmes be arranged in order to equip and upgrade the educators with necessary skills to enhance the effective provision of instruction (Allen 2010). Furthermore, Ari et al. (2015:365) suggest that 'in-class activities should be designed in accordance with the physical, mental and affective developmental steps of the learners. Grading and assessment is therefore a critical areas of classroom management for the improvement in Mathematics. When conducting assessment and grading exercises, educators may employ non-achievement factors in grading as an attempt to serve important goals of instruction, including motivating learners and providing disadvantaged or weaker learners with a fair chance to succeed (Hochweber et al. 2014).In this regard, the researcher noted from research findings that learners are commonly given assessments continuously by way of recapping the previous lesson, oral questioning, daily classwork, informal tests, formal tests, and examinations. Some Mathematics educators are not taking into cognisance all levels of difficulty whereby the low achievers answer a few questions while the high achievers will have some thought-provoking questions to tackle. It appears from interviews that educators are not viewing the ATP as a guide to what learners should accomplish. Assessment policies and lower percentage pass rates as decided by the DBE are

negatively affecting the grading and quality of assessments. Also, the social and economic background of learners is impacting on the effectiveness of classroom management.

4.4.3.3 Group work

Group work is another a key issue in the managing of classroom teaching. Group work as a teaching strategy involves learners working together in a classroom setting in order to carry out a given task. Research findings suggest that learners learn more from each other through group activities or peer learning. One educator participant said, "I am a very firm believer in peer tutoring, I sometimes feel like a kid who gets sixty out of seventy can actually explain better to a kid who gets forty than I can" (FGB1, p9).

FGD4 (p8) found that "sometimes it helps to have them in groups whereby the smart ones can be helping the struggling ones, because sometimes they understand better when they are getting help from their peers".

FGB4 (p13) added, "I found that with that the kids that wanted to work, work, the kids that didn't want to work no work is done and I contact parents when necessary".

In justifying the need for group work, FCG1 (p3) commented:

> It's like the inclusivity part of it, because like here in our school is a very diverse language groups, or different tribal groups and different races, so I think it's important for a teacher not to promote a particular language but promote inclusivity when you are delivering your lesson. And I should also mind that the English that we use should be a mild simple one, it shouldn't be the type of English which would confuse the learners, although in Mathematics we do have those terms which are used in Mathematics and they are a little bit confusing with the learners.

It was also indicated by FGC4 (p6) that a diverse educator should use a simple medium of instruction and not promote a particular language, but rather accommodate inclusivity during lesson delivery or while managing group activities. Close educator monitoring of group activities was done to enhance positive results.

Another participant explained that if learners' activities are not well supervised, they may end up getting involved in activities or discussions which are not related to the given task (FGD5, p4).

FGC4 (p12) responded with:

> That's true and a very important, because a very disturbing voice can suddenly come in while you are busy teaching, they are going to disrupt the whole lesson. More so they've got a negative attitude towards the subject. So, they don't want to cooperate, already that negativity of the subject is there and there comes someone double tragedy, who wants to disturb so they need to be managed.

It is beneficial to encourage learners to discuss when writing classwork, as this promotes teamwork. HD (p1) said,

> I normally encourage learners to discuss when writing classwork, in a sense that I may explain a concept, and one will understand better than the other and if there are core learners, explaining to one another they are able to explain it more, not only more than me but they will explain it the way as learners. That is what I encourage during classwork.

By contrast, FGB5 (p8) argued that "group work doesn't really work in maths", while FGB6 (p8) added, "Ja, I can never go that route of using group work". On the contrary with related literature which he supports the idea of utilising group work as evidenced by Muller (2014) who points out that learner participation helps learners to develop intellectually or culturally. Furthermore, Protheroe (2007, cited by Stols et al. 2015) posits that in a Mathematics classroom, learners are expected to be actively engaged in doing Mathematics activities, for instance, working on challenging problems, making interdisciplinary connections, communicating mathematical ideas and generally encouraging each other. In a Mathematics class, a learner needs to understand the educator's instruction. If there is a challenge in understanding the educator then assistance can be sought during group work, whereby other learners will explain in way that will make it easier to conceptualise. Smaller groups are easier to manage and enable participants to share mathematical knowledge. As observed and experienced by the researcher as an educator, group work activities are usually beneficial but require the educator to timeously supervise the group activities. Research findings indicate that some educators do not understand the importance of utilising group work as a learning strategy, and are thereby denying some learners opportunity to participate and learn from peers.

4.4.4 Theme 4: Management of classroom skills

The findings that are reported under this theme differ from the previous section in the sense that classroom skills are seen as those educator abilities that can be employed to enhance effective classroom management. Hence theme 4 comprise mostly of the responses to the research question on educator knowledge and skills expected of in respect of Mathematics

educator. Three sub-themes emerged, namely time management, classroom discipline, and motivation.

4.4.4.1 Time management

Time management is a crucial aspect of classroom management as Mathematics educators need to use the time as allocated in order to fulfil the requirements of the DBE as specified in the CAPS curriculum. The current study found that Mathematics educators should be good time managers since the overall duration of Mathematics lessons is prescribed in the ATP. One participant noted, "that means slow learners have got more time for them to focus and revise over and over until they understand the concepts" (FGA5, p10). Research findings indicated that subjects are allocated different teaching times per week. An HOD participant said, "when you do the timetable, for instance the Life Orientation (LO) as a subject across is allocated two hours, Mathematics across is allocated four and a half hours, that is per week" (HD, p5). One participant confessed during a focus group discussion that he assigns a learner to take register on his behalf, explaining that:

> As a teacher you can easily elect one learner, not that you giving him an activity to do, but you are just requesting him or her to give you a list of learners who are absent, when you enter the classroom, he will just say we have two absent learners, these are the names, then you record the names. In that way you can quickly start teaching (FGD3, p28).

Another participant indicated that he assigns learners to check each other's homework so as to increase time for instruction delivery:

> I think one other thing, because we have big classes hey, you can like maybe when checking homework, you can use other learners to peep through to check whether others have written or not, So, they all open their books, then we use these learners to peep through learners' books. They check for each other and can mention at times who did not write the work. This way you are able to see most of them had done the work or not, unlike you moving around the whole class where there is no space to walk around in most cases (FGD3, p6).

It was also commonly found throughout the data collection process that educators are using a prescribed curriculum which specifies that certain topics and specific concepts need to be completed and assessed as scheduled by the Gauteng DoE (HD, p5; FGD3, p6; FGD5, p6; FGD1, p6).

During focus group discussions, some participants expressed their support for teaching with the aid of modern equipment. One participant said,

> Like we have smart boards, what is nice with smart boards is that sometimes you explain certain concepts there are nice videos that you can just play for them in the smart board, and leaners are able to understand better (FGA5, p9).

FGB6 (p4) agreed: "Ja I guess its stimulation from the computer screens, if they see a computer screen immediately it applies to them, now it's interesting, now they want to pay attention. It creates an interest".

FGB4 (p7) said,

> But you see on tablets, you get a script app where you can connect it to your projector and basically while I'm writing I'm looking at the kids and is on the screen and I'm watching them and I'm looking here. And so, there is no miscommunication and if I need to erase something, I don't have to physically do it here, click a button, erase and I carry on saving a lot of time.

Another participant echoed, "Eish, these pupils may want to carry on watching, so must you make sure that time for doing other things is not wasted on endless watching of movies or repeating experiments which interests them" (FGA4, p13).

> Related literature propounds that time management governs the execution of the lesson, introduction of a concept or lesson, group work activities, and conclusion of a lesson (Forsyth 2007), while Akin et al. (2016:772) assert that "the actual time students spend on meaningful tasks is fundamental to their learning gains". In support, Sieberer-Nagler (2016:164) explains,
>
> The time a teacher has to take to correct misbehaviour caused by poor classroom management skills results in a lower rate of academic engagement in the classroom and that effective classroom management involves clear communication of behavioural and academic expectations as well as a classroom environment conducive to learning.

Time management therefore provides a clear lesson structure, thereby positioning learning tasks into manageable units. Research findings indicated that the use of modern technology has been found to save a great deal of teaching time, unlike writing on the normal chalkboards.

Furthermore, feedback on assessments is provided quickly when using computer-related equipment, although there is not enough such equipment for all classrooms.

Research findings indicate that some Mathematics educators seem not to be managing their time properly as was confessed by one participant who assign a learner to mark the attendance register or check other learners' homework (FGD3, p6).Hence learners are being assigned to perform educator responsibilities. Time is unnecessarily being spent on repeating explanations of concepts, and learners are not given sufficient time to conceptualise the work being done. Time management is therefore an important skill necessary for the improvement of Mathematics education in Gauteng province.

4.4.4.2 Classroom discipline

Classroom discipline is what Mathematics educators employ to keep the class under control so as to maintain desired behaviour while simultaneously minimising unwanted actions. Several disciplinary problems were identified by participants as a challenge for effectively managing their classrooms. These problems included unnecessary comments or walking about, continuous talking while the teacher is giving instruction, singing, tapping desks, throwing each other papers, making mosquito sounds, chatting with friends, lack of work ethic and playing with cell phones during class time. Some of the classroom disciplinary problems were noted as being caused by an insufficiency of resources. One participant complained that –

> I had a very difficult learner, whenever I have their class that one will always disrupt my teaching. He was so not manageable, he would sing, walk, tap the desk and wasn't paying attention or doing work" (FGD5, p9).

An HOD participant pointed out:

> Most of the learners without the construction instruments are bound to be, to make noise as a bad behaviour, because they are not doing anything. Very few learners are having the protractors, the compasses and so forth. So, in place of doing work there, instead they start making noise. (HA, p2)

In addition to classroom discipline, an educator participant mentioned:

> Drug abuse and alcohol; some learners come drunk and I normally call the office for help. But they keep coming drunk, they don't care at all. Some parents are called to come for a meeting but they seem to be tired of helping their kids also (FGA3, p21).

One educator participant explained how he manages discipline and said, “The other time a kid was eating in my class and made a mess, I made him sweep” (FGB1, p20). Another participant noted, “Sometimes you ask a question and they will answer well, then others make unnecessary comments” (FGD5, p5). Furthermore, FGD2 (p8) observed, “I think generally there’s a shortage of resources to assist learners with emotional problems so it becomes a challenge”. In support, FGD4 (p9) added:

> Because I’ve got one learner that I teach, you can hardly hear what he’s saying but he will be saying something and maybe he needs help or what but I cannot always help because I’m not sure exactly what he’s saying. Ja, if schools had resources to assist such a learner. Or if parents could afford to take such a child to a special school that will help.

FGB3 (p20) also pointed out that: “the school’s discipline has to function in order for your classroom rules to function”. More participants shared their experiences and suggested strategies to maintain order in classrooms. One such participant explained:

> What I do is that for the others who are not well bright, I make them sit separate from the ones that are struggling. I then give those struggling more attention and less work so as to catch up while brighter learners are busy with different questions because some who are bright will keep on doing work without much supervision (FGD1, p7).

Another strategy identified by several participants was the consistent utilisation of classroom rules (HD, p4; FGB1, p19; FGD3, p16). Participants debated and agreed that ill-disciplined learners should not be punished in a way that will conflict with their right to education (FGD1, p21; FGD2, p18). Involving parents or referring the problem learner to the HOD were more strategies suggested to curb indiscipline in the Mathematics classroom (FGB5, p27; FGB3, p27).

Related literature declares that an educator should be knowledgeable of all leadership styles and be competent in using them in accordance with instructional goals, classroom activities and learner needs as well as learner characteristics (Grapragasem et al. 2015). In addition, Kruger and Van Schalkwyk (2016) propound that an educator should lead and direct the teaching and learning activities. Therefore, it is the educator’s responsibility to establish strategies for a calm and encouraging learning environment. Sieberer-Nagler (2016:164) alludes that, “Learners do things on purpose that they know they should not do. Discipline is

therefore an action taken on the part of the teacher to enforce rules and respond to student misbehaviour". Sieberer-Nagler (2016) added that educators must show learners what they should have do to, give learners as much ownership of the problem as they are able to handle then give learners options for solving the problem and finally leave the learners with their dignity intact.

Research findings brought out a number of disciplinary problems which Mathematics educators encounter as they manage their classes. Strategies to curb the challenges were cited and supported by related literature. The effective employment of relevant leadership skills plays a significant role in managing Mathematics classes. Therefore, Mathematics educators need to know when and how to utilise the different management styles in their classrooms. Furthermore, it is advisable to be consistent when using classroom rules in order to instil and maintain classroom discipline whereby learners are focused and participating. Parents need to play their parental role in ensuring that their children are physically, socially, as well as emotionally ready for effective learning.

During the data collection, the researcher noted that participants were in agreement that there were experiencing disciplinary problems as they manage their classrooms. However, the presence of disciplinary problems in schools cannot be debated even though the small sample utilised is not sufficient to generalise what happens in most schools in Gauteng province. Such challenges usually emanate from learner's background, lack of parental support, educator lack of skills, poor time management, insufficient resources, peer pressure and substance abuse.

4.4.4.3 Motivation

Motivating learners contributes to effective management of Mathematics classes. Mathematics is commonly viewed as a "scary subject" and the pass rate in Mathematics is a huge concern in all schools. Such anxiety requires educators to be responsible for creating a non-threatening environment which is intended to encourage a positive learning approach towards the subject. One participant shared his frustration:

> Whatsapp-ing and all that social media, taking each other pictures is a huge problem to manage, so you must try and make sure they stick to what they're supposed to do. I wish there was maybe a way of managing them, you know each and every learner is different. It is frustrating that when you are teaching or telling them to do some work, they are not interested at all and they continue taking photos or on Facebook or Twitter" (FGD5, p4).

Research findings showed that some learners are petrified of Mathematics. FGB2 (p1) said:

> And I suppose emphasising the importance of making sure that they understand that and like you say, repeating it over and over and that they don't doodle, or they don't daydream, or get scared and that they actually concentrate the whole time and keep busy, practice as well.

In support, FGB6 (p17) added,

> I think maths is one of the most intimidating subjects for most students and it should be like a very strict non-teasing, non-laughing as to the questions' environment, because otherwise no one wants to put up their hands.

Fear of the subject could be linked to the fact that it involves abstract concepts and unique symbols which require problem-solving skills and abstract thinking. This study's findings also showed that Mathematics educators should relate theory to real world. FGB5 (p2) said,

> Actually, what I normally do is I use practical examples, like this is when we do volume: "Let's go to the more imaginary now", we go to the mall, we look, we get a shoebox: "What is the volume of that shoe box?" You actually make them think, we not just doing this for fun, this is what you going to apply one day. When we do text I'm asking them, this is what you get for your salary when you minus, so they actually see maths in real life.

FGA3 (p12) confirmed that "other than just hearing it theoretically right, watching the video, it makes much more sense to them".

Strategies of motivation identified by the study participants were noted as follows: applauding each other, inviting motivational speakers, provision of rewards in the form of material or non-material items, and displaying learners' names in relation to marks obtained after a formal assessment. Furthermore, educator skills and characteristics were identified as contributory motivation strategies for effective management of Mathematics classrooms. Examples in this regard included being friendly, dedicated, approachable, having good communication skills, utilising modern technological equipment, making lessons fun, employing simple language to explain concepts, and being mathematically knowledgeable.

One participant said, "Ja, I guess its stimulation from the computer screens, if they see a computer screen immediately it applies to them, now it's interesting, now they want to pay attention. It creates an interest" (FGB6, p4). On the other hand, another participant cautioned

that “the information that we get from the internet nowadays, it is not filtered, so management is needed” (FGA2, p13). This implies that the utilisation of modern technology greatly assists in motivating learners, however strict management is needed. An HOD participant confessed that, “No with discipline is a little bit broad, but sometimes you become impatient with the learner and you will shout at the learner, but what I avoid most is doing corporal punishment" (HD, p2). In responding to the question on, ‘how should the different grading be balanced and managed in classroom’, another participant said, “Like in maths, when you teach, you start from the simple ones” (FGC2, p9). FGC6 (p9) commented: “Yes then you go up in terms of the grading, you can’t start with difficult things, then you end with easy”. In agreement, another participant added, “So we test the simple understanding first, then they go to more complex” (FGC1, p9).

Some of the suggested strategies are supported by Biza et al. (2015) who find that offering praise, encouraging learners to participate, judging appropriate questions, inviting explanations may contribute to learners’ positive participation during instruction. Along similar lines, Mirza and Iqbal (2014) stress that learners tend to develop mental lethargy and excessive enervation from a lack of motivation, overcrowding in a classroom or family-related problems, resulting in a lack of focus and ill-disciplined behaviour. In this regard, Bulls and Solity (2013) advise educators to avoid negative comments, as such comments may lead to learners feeling withdrawn and discouraged from participating in class. Furthermore, Kruger and Van Schalkwyk (2016) encourage educators to understand their learners’ backgrounds in order to strategise an effective motivational strategy. Frustration from the educator may indicate lack of respect for the value of individual differences in learners (Unal & Unal 2012). As noted, factors such as overcrowding, lack of resources, classroom discipline challenges, and lack of educator knowledge and skills hinder learner motivation to participate.

The researcher has noticed that learner participation in Mathematics is highly associated with motivation. Mathematics educators should teach and assess from simple to complex so as to accommodate all learner abilities and to keep them encouraged to pursue the subject. Research findings indicate that learner participation is not being adequately encouraged. Some educators are not creating confidence or interest in the subject. Therefore, most learners are not motivated to excel in the subject. Some Mathematics educators in Gauteng province seem not knowledgeable enough to teach the subject, while others are not approachable, resulting in chasing learners out of class or shouting at learners. As a consequence, learners are scared of

the subject or misbehave. Hence or otherwise, the set goals of Mathematics teaching are not easily achievable without effective classroom management.

4.5 CONCLUSION

In this chapter, research questions were answered by findings from interviews, focus group discussions as well as limited observations as presented and discussed according to the four themes and sub-themes that emerged during the thematic data analysis. Findings of this research study were discussed and supported by reference to the related literature.

Sufficient data was collected, prepared, organised and thematically analysed. Emerging codes were combined to form sub-themes. The sub-themes resulted in four main themes, namely management styles in Mathematics classrooms, resources for the management of Mathematics classrooms, management of classroom teaching, and management of classroom skills.

The researcher explained the research findings under each theme, citing the participants' views and sentiments. Follow up workshops were carried out at each participating school in order to present the research findings and simultaneously sought confirmation of data collected. Related literature was discussed per theme. The researcher then concluded every main theme by giving personal views in relation to Mathematics education.

The following chapter will present answers to the research question and sub-questions in the form of a research summary. A final research conclusion will be drawn based on the research questions in relation to the research findings. Recommendations will be highlighted for practice and policy implementation, and future research studies. The challenges encountered during research as well as research limitations are also discussed.

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CHAPTER 5
SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.1 INTRODUCTION

In the previous chapter, the researcher presented and discussed the research findings in terms of themes which emerged during the data analysis process. The four themes discussed were management styles in Mathematics classrooms, resources for the management of Mathematics classroom resources, classroom skills, and management of classroom teaching. The findings indicated that even though Mathematics educators are dedicated to their work, the challenges which they face negatively affect the management of their classrooms.

In presenting the aim of this study, it was emphasised that the main focus was on *classroom management* and not the teaching of the subject Mathematics in classrooms**.** Classroom management has to do with establishing, maintaining, and restoring the classroom environment in an operative way for teaching and learning **(**Akin et al 2016). In Mathematics, classroom management therefore considers all efforts by skilled educators in ensuring an organised classroom environment which allows the educator to provide instruction with minimal distractions, learners being positively engaged and participating to achieve the teaching–learning goals.

The understanding that the researcher obtained during this investigation is that, in practice, classroom management and the process of teaching in classrooms are intertwined. Educators can never be busy with one or the other exclusively. Part of teaching is to manage the process and one cannot manage for the sake of controlling or organising alone. In support of this notion, Marquez et al. (2016) contend that effective classroom management is a key predictor of learners' success. Learners in well-managed classrooms are found to be more academically engaged (Stronge, Ward, Tucker & Hindman 2007). It is also vital to note that performance in Mathematics can be affected by various other factors like peer influence, learner socio-economic background, besides poor classroom management. Management during the teaching process must therefore always serve the purpose of effective and efficient teaching, since classroom teaching will never serve its main purpose if it is not supported by good classroom management. Furthermore, classroom management could potentially provide Mathematics

educators with the knowledge necessary to create classrooms where students can succeed academically as well as behaviourally (Birman, Desimone, Porter and Garet 2000). Incidentally, Mathematics educators are able to take control of their actions as they teach and can harness their personal strength, which is central to school effectiveness. Furthermore, Mathematics educators are faced with a multitude of tasks which all require adequate responses. It became clear during the study that in classroom management, Mathematics educators face a range of challenges such as overcrowding, insufficient resources, disruptive learner behaviour, lack of parental support, imposed teaching plans, and insufficient skills and knowledge. Against this backdrop, I posit that apart from teachers themselves, HODs and school principals play an important role in improving the situation of Mathematics teaching and the management of Mathematics in schools. It is urgently required that management staff and government officials carry out classroom management workshops to equip Mathematics educators in Gauteng province with relevant classroom management skills, and involve them when drafting the ATP for the improvement of Mathematics education.

This chapter presents a detailed summary of the whole study which is followed by conclusions drawn from related literature review and the empirical study. This is followed by key recommendations in light of the findings, and the conclusions drawn from the study.

5.2 CONCLUSIONS IN TERMS OF RESEARCH QUESTIONS

In this section, conclusions with regard to the research questions are provided. This approach helped the researcher in assessing current practice by using the research questions as guidelines. Data was collected in the natural settings of participants, these being the schools and the classrooms of the study participants. The researcher also observed events as they unfolded in managing Mathematics classrooms, and shared in the lived experiences of the Mathematics educators.

The conclusions were reached by comparing the findings of interviews and focus group discussions with personal observations and related literature, as discussed in Chapter 2. It should be noted that the arrangement of this section does not correspond on a topic-for-topic basis with the contents of Chapter 2 or Chapter 4. Instead, the research questions guide the structure, with the result that a particular subsection, such as *discipline* for instance, could have been discussed under any of two sub-paragraphs, that is section 4.4.5.2, whereas *Group work*

as another example, is not discussed as a separate topic because it was felt that the conclusions on it were sufficiently covered in section 4.4.4.3.

The conclusions are discussed in the following sections:

1 What are the challenges faced by educators in Mathematics classroom settings?

2 What are the functions of classroom management in Mathematics classrooms?

3 Which classroom managerial skills can be applied to enhance better performance in Mathematics?

4 Is educators' knowledge sufficient to provide and manage mathematical instruction?

5 Which elements should be included in a model for effective classroom management?

5.2.1 What are the challenges faced by educators in Mathematics classroom settings?

It is evident, if one refers to the statement by SACMEQ III (2007), that the majority of South African learners are not performing well in Mathematics. The pass rate at Matric level (Grade 12) in Mathematics is low, even in well-resourced schools with adequate availability of qualified teachers and other essential learning materials.

The current study was undertaken at a time when large numbers of organisations, individuals, and departmental officials described the low pass rate, in Mathematics in particular, as a serious problem in the field of basic education. Although the researcher acknowledges that these concerns are valid and must be addressed at all costs, it appears that the poor achievement in Mathematics as a subject is sometimes singled out unfairly because of its intellectual nature which makes it appear inherently problematic. As noted by Mizar and Iqbal (2014, p. 13) 'Mathematics is a vital subject which develops abilities like thinking, reasoning, conceptual understanding, procedural knowledge, and problem-solving which are requirements to become good citizens.' The researcher agrees with Muller's (2014) contention that it is challenging for learners to develop intellectually or culturally without studying Mathematics. As such, Mathematics educators are expected to be innovative and able to improvise to enhance classroom management and make up for lacking resources. The teachers who were interviewed for this study all worked according to set goals, and were considered to be among the best organised teachers in their schools.

More specifically with regard to classroom management in Mathematics classrooms, the researcher noted that Mathematics educators share challenges such as high teacher-to-pupil ratios, and a lack of physical facilities, especially of equipped classrooms such as mathematical laboratories. This implies that resources include physical, material or emotional requirements for creating and maintaining a conducive teaching and learning environment. In addition, disruptive behaviour, insufficient mathematical tools such as protractors or compasses, as well as insufficient mathematical subject knowledge, and an insufficient supply of sophisticated materials like computers, smart boards and PowerPoint programmes are more challenges faced by Mathematics educators. The following concerns or challenges apply specifically to the management of Mathematics classrooms.

1 The teacher–pupil ratio is a very real concern. Some of the participants highlighted this aspect as their main problem. It was mentioned that in some cases, classes have from 65 to 80 learners per class. The researcher noted that, Mathematics classrooms have twenty percent to thirty percent more learners than do other subject classes. This is possibly because Mathematics forms the basis of problem-solving skills which can be applied in any area of further studies.

2 Disruptive behaviour was also identified as a major concern. Apart from the more usual disturbances of incessant talking, playing with cell phones, unnecessary walking about and poor work ethics, Mathematics educators reported that potentially negative behaviour towards educators and co-learners is also a frequent occurrence in their classes.

3 Insufficient educator knowledge has also been identified as a challenge with managerial ramifications. As discussed in previous sections 4.4 this relates mainly to educator qualifications, the updating of their skill-sets and not having suitable learning materials available in classrooms. The researcher became convinced during the research study that some educators were not trained to teach geometry as it was not included in the curriculum, together with the fact that most educators have not been equipped with proper classroom management skills such as time management, classroom discipline and motivation which the researcher perceive as currently major obstacles in classroom management.

4 Time management was discussed as a challenge for Mathematics educators as imposed by the curriculum for implementation over a specified period. Some Mathematics educators reported that, at times, they assign learners to take class

attendance registers as well as check homework. In the researcher's experience, improper time management drives Mathematics educators to rush through the curriculum. The rush can result in learners misbehaving, failing to understand concepts, or in negative attitude towards Mathematics as a subject.

5 A further challenge is the lack of financial means to engage classroom specialist supports such as psychologists or disciplinary officers, to assist learners with emotional and psychological needs. Some participants indicated during the data collection that there were learners who were threatening educators, always angry, and rude towards others hence negatively impacting on effective classroom management. Unfortunately, the Gauteng DBE seem unable to afford to employ the additional specialists per school such as psychologists.

6 Some learners had socio-economic challenges and could not afford mathematical instruments, and other stationery requirements. Learners need to have all relevant stationer and other learning materials. Additionally, learners are expected to be focused and perform instructed activities timeously.

7 Insufficient provisioning and supply of sophisticated materials such as computers and smart boards and mathematical laboratories is clearly an issue in classroom management. During data collection, participants indicated that they do not have mathematical laboratories in all schools. Furthermore, smart boards were not installed in all classrooms. Most schools are not providing Mathematics educators with laptops, smart phones or even PowerPoint projectors necessary to illustrate or show some abstract mathematical concepts.

8 The lack of self-efficacy in relation to Mathematics education has been identified as a significant contributor to the reason why learners may struggle to pass Mathematics. The notion is supported by a number of authorities such as Marquez et al. (2016, p. 89); Hoy, Davis and Pape (2006) who agree that the educators' sense of self-efficacy in creating well-managed classrooms has been associated with greater learner achievement. Hence, learners are expected to perform better in classrooms with good management than in disorganised or chaotic classrooms. Educators are able to cover more mathematical concepts when they succeed in restoring order in their classrooms.

9 Lack of sufficient parental support in terms of resource provision and nurturing of good behaviour was identified as one of the major setbacks to effective classroom management. Educators voiced concern that some parents were not supporting educators' efforts to improve learners' behaviour in terms of work ethic and bringing the required learning materials to school. If parents do not support such efforts, the respective learners tend to become unruly during instruction time.

5.2.2 What are the functions of classroom management in Mathematics classrooms?

The conclusions reached in this section are mainly based on two premises. The first is the fact that the classroom is a unique and complex social, cultural, and learning environment comprised of active communications between the educator and learners from diverse backgrounds for a common purpose (Grapragasem et al. 2015). The second premise is the following (Ersozlu1 & Cayci 2016, p. 144):

> Classroom management involves teachers' individual characteristics, the teaching strategies, methods and techniques which she/he uses while lecturing, his/her harmony with the social environment, the cooperation between school and family, physical conditions of the classroom, students' characteristics and requirements, the structure of the school, the rules adopted by the school and the atmosphere formed in the class.

In linking these definitions with the findings of the study the researcher concluded that classroom management in Mathematics classrooms has two integrated functions, namely planning and organisation. As classroom managers, Mathematics educators must be able to effectively plan and execute what has been planned. Planning can thus be seen as the first step that should lead to the improvement of Mathematics education. If Mathematics educators take this planning step beforehand when deciding on classroom activities to be performed, it can lead to an improvement in Mathematics education. The second step that deals with implementation and organisation is when learners are actively involved in attending to curriculum matters and the improvement of their abilities in Mathematics. In the remainder of this section, the researcher elaborates on the conclusions by linking the findings from the research with two critical areas of classroom management, namely time management and the setting of classroom rules.

1 Time management

In Mathematics, time management as an organisational function is associated with finding ways to work efficiently within existing parameters. The educators who were interviewed emphasised that they work within a prescribed curriculum where particular topics and specific concepts have to be completed and assessed within a given timeframe, as scheduled by the Gauteng DBE. The CAPS curriculum, for example, must be completed according to time limits set by the DBE. Consequently, educators feel that they do not have a lot of room within which to manoeuvre hence feel restricted. Some participants involved in this research study mentioned using smart boards or allocating learners to take the register as aspects of time management as it is time saving. The researcher believes that some Mathematics educators do not make a serious effort to engage in time management. Some of those educators can go to the extent that time management almost governs key classroom activities such as the execution of lessons, the introduction of a new concepts, group work activities, and lesson conclusions. The researcher is of the opinion that it is in the nature of Mathematics educators to work systematically and plan their classroom activities with precision. They should be encouraged and supported by managerial staff to create their own time management schedules and work accordingly.

2 Setting of classroom policy and rules

In general terms, it is important that the classroom policy and rules for Mathematics classrooms be aligned with the school policy and rules. Classroom rules are used in order to implement classroom policy. As is the case in all school classrooms, managing discipline by controlling and monitoring learner behaviour is vital in Mathematics classrooms. Specific rules should be linked to specific learner behaviours, and to the fact that computers and other high-tech Mathematics-teaching materials require special care. It is further of critical importance to involve Mathematics learners themselves in the process of setting their own classroom policy and rules, to encourage learners to respect and abide to rules.

5.2.3 Which classroom managerial skills can be applied to enhance better performance in Mathematics?

The main conclusion in this section is that the application of different classroom leadership styles in various situations serve as the basis for managerial skills in Mathematics classrooms. Participants confirmed that an autocratic style in which educators control the proceedings by imposing classroom rules was acceptable, “under certain conditions”. A number of participants

explained that they used it mostly at the beginning of lessons, when a new topic was being introduced, or when giving specific instructions to restore order in the classroom. Their preference for autocratic leadership thus seems to be of a pragmatic nature. Educators preferred a top-down approach depending on the concept to be taught, on the learner behaviour, and on the specific goals to be achieved. Rewarding and punishing strategies were employed to the extent that educators were active participants in classroom affairs, and learners were passive contributors.

It is disconcerting to note that Mirza and Iqbal (2014) are of the view that,

> In general, Mathematics teachers teach from textbooks without relating the concepts to daily life experiences and they start lessons by dictating formulae and asking students to memorise those formulae in order to solve the questions. Mathematics teachers generally do not collaborate with colleagues to discuss concepts or teaching methodology.

This notion tends to promote the view that Mathematics educators are autocratic in nature without possessing the vital skills of creativity, and that they take very little consideration of learners' needs. The researcher argues that this kind of understanding is biased and is not an accurate portrayal of reality. Mathematics educators certainly do not support or implement the permissive classroom management leadership style; however, they are in favour of including democratic leadership in their classroom practice. Democratic leadership was clearly displayed in classrooms that were managed in an interactionist style by involving learners in establishing and developing classroom procedures, and by involving them in the execution of these procedures. During the focus group discussions in particular, Mathematics educators openly favoured the democratic idea of allowing participation and being accommodative and approachable in their classrooms.

The researcher is of the view that educators combine different kinds of leadership styles when managing their classes. Effective classroom management can be enhanced through the employment of leadership styles which can be situational or contextual. Furthermore, leadership styles can be effective when used together with efficient teaching strategies, different methods and techniques in a classroom within a well-organised climate. In the researcher's point of view, educators choose the democratic classroom management approach because they believe it is best suited to the situation, to ensure good learner behaviour and in achieving learning goals.

The particular classroom management skills that relate to a contextual leadership style and yet are also crucial in classrooms are motivation and communication as well as decision-making.

1 Motivation and communication

During the study, it became clear that motivation and communication were regarded as classroom management skills that usually function in concert. The association between communication and motivation became clear when participants indicated that these activities normally happen together in conversations between educators and learners in pursuit of knowledge. Communication and motivation cannot be separated. Learners can either be motivated or demotivated as the educator carries out daily classroom routines which include creating the setting, decorating the room, arranging the chairs, speaking to learners and handling their responses, putting routines in place (and then executing, modifying, and reinstituting them), developing rules, and communicating those rules to the learners (Sieberer-Nagler 2016). While no learning at school occurs without motivation, motivation can only be successful if key learning material is properly communicated. The conversation between the two parties should employ sounds and symbols on the one hand and non-verbal cues such as body movements and face–eye coordination on the other, to maximise the effectiveness of the process. In the case of managing Mathematics classrooms, good communication between the educator and learners is of critical importance because of the presence of abstract thinking and the effective utilisation of materials in the learning process. Motivation, together with communication, can be accepted as one of the crucial influences that determines the effectiveness and fruitfulness of Mathematics as an educational process.

2 Decision-making

In general terms, decision-making is the process of choosing the most suitable way of solving a problem or handling a situation. In this analysis, the focus was on three kinds of managerial decisions that are the researcher’s own opinion directly linked to solving classroom and learning-related problems in Mathematics classrooms. These are maintaining classroom discipline, managing teaching, and assessment.

The first group of decisions have to do with maintaining classroom discipline in these classrooms. During the study, most participants suggested various strategies that may be collectively described as introducing punishment and rewards systems. Examples of such measures were identified as seating arrangements, consistently applying classroom rules,

involving parents and referring the problem learner to the HOD or a psychologist. The researcher understands that a whole range of disciplinary measures, including those just mentioned, must be available to teachers. In a deeper analysis, the researcher however concurs with Allen (2010) who emphasises that disciplinary problems can be prevented if educators consistently aim to shape learners' behaviour in positive ways by interacting with them on a continuous basis. This strategy squarely places the emphasis on taking decisions regarding preventative disciplinary measures. In a Mathematics classroom, this kind of approach should discourage unwanted behaviour and encourage desirable behaviour while developing learners' ability to solve mathematical problems at the same time. Disciplinary problems will largely be prevented if learners are actively involved in constructing their own learning by participating during lessons and in classrooms in general. As part of such a strategy, Mathematics learners could, as a variation to classroom teaching, be placed in small groups with specific tasks to attend to. In this way, learning and being self-disciplined at the same time should be inculcated into learners' behaviour as one process.

The second group of managerial decisions are directly linked to problems concerning the *management of teaching* in Mathematics classrooms. During the current investigative study, it became clear that educators have a good understanding of the functioning of well-known teaching methods, as well as how learning should be enhanced by using particular learning strategies and tactics. All participants confirmed that they had been trained in various ways. Despite all the support received, educators still feel that they have important shortcomings as Mathematics educators (see section 5.2). The researcher observed that despite some obvious shortcomings, Mathematics educators do possess a range of teacher competencies and have the necessary knowledge as well as the opportunities to teach Mathematics effectively. According to Bussi and Mariotti (1999, p. 32), a 'Mathematics educator is faced with critical and unique roles in the classroom such as being friendly motivator and yet on the other hand being a disciplinarian.' Educators are expected to discipline learners with unruly behaviour and then introduce the learners to suitable ways of mastering the conflict and achieving expected goals. Apart from possessing theoretical knowledge, educators have to make sound and innovative decisions on the management of their teaching. To begin, they have to decide whether their understanding of mathematical contents and methodology is at a level where they can engage learners' trust and build their confidence. Educators have the responsibility to introduce up-to-date knowledge and skills into their classes to correspond with ever-changing developments in society. Another conscious decision that Mathematics educators must make is to be seen as

inspirational and innovative teachers. Educators who employ a range of activities in their instruction keep learners alert and interested in the subject, and prepared to learn with a positive mindset (Etuk et al. 2013). When learners feel or perceive that their educators are adopting appropriate methods to teach them, they are motivated to become actively involved in the teaching–learning process (Etuk et al. 2013).

The third kind of managerial decisions to be made relate to *assessment*. Assessment is a core activity in all schools and has particular significance in Mathematics classrooms. The formal assessment requirements, as explained in ATP and confirmed by participants, oblige Mathematics educators to comply with a whole range of official prescriptions regarding external and internal assessments. In addition to the prescribed curriculum, Gauteng learners have to complete a range of examinations as instructed in the ATP. Within this formally arranged environment, educators are required to decide on ways to apply the different assessment instruments in a logical and meaningful way and to integrate assessment and grading exercises into their teaching programmes. As part of their characteristics, Mathematics educators must be able to understand the strengths and weaknesses of assessment and grading. The researcher's point of view is assessment must also serve broader educational aims including motivating learners, and providing disadvantaged or weaker learners with a fair chance to succeed. Mathematics educators should make assessments in a professional way based on ethical considerations. While identifying learners' strengths and weaknesses, learner assessment should also serve as a guide for teachers on how and what to upgrade with regard to their own competencies and skills.

5.2.4 Is educators' knowledge sufficient to provide and manage mathematical instruction?

Educators' knowledge levels are closely linked to their personal characteristics, qualifications and skill levels. In the context of this study, educators' knowledge was shown to have two main aspects, namely teaching capability, and classroom management skills. Educators acquire their knowledge through initial teacher training, continuous professional development and day-to-day teaching experience. Development activities include courses, workshops, seminars and conferences, all containing elements of training in classroom management. In spite of these efforts, however, it is clear that the knowledge levels of South African educators are seriously questioned. This is evident from the regular criticism lodged about the pass rate of Grade 12s in particular, and about South African school achievement in general. As indicated in section 1.2 of this study, South Africa is ranked 138th out of 140 countries in terms of its quality in

education, and ranked last in terms of its eminence in Mathematics and Science education (WEF 2015-2016). These kinds of statements reflect negatively on educators' knowledge. The knowledge levels of Mathematics educators, in particular, is portrayed in a very negative light. The researcher, however, believes that the position of Mathematics educators differs from that of other educators. Mathematics educators deal with problems that relate to the teaching of an abstract subject with a specialised technical language and symbols that make it difficult for students to learn on a daily basis. Apart from responding to the open outcry about underachievement in Mathematics, educators must also be responsive to new demands and ever-changing curriculum requirements.

The question of whether Mathematics educators are really knowledgeable, need to be answered in two ways; first, in terms of actual subject knowledge that is directly related to teaching, and second, in terms of classroom management issues. From a broad perspective actual subject knowledge and teaching is closely related to building up professional development points and continually updating teaching skills in terms of the system of Continuing Professional Teacher Development (CPTD). (SA. SACE, Continuing Professional Teacher Development Management System Overview 2011, p. 8). The researcher and as an educator in Mathematics encourages other educators to recognise the importance of knowledge-building initiatives and concomitant development exercises such as workshops. However, as discussed in section 5.3.3, educators' knowledge relates strongly to qualifications, the updating of skill-sets, and the lack of suitable learning materials available in classrooms. The research findings from this study indicate that most classes were not designed for Mathematics and furthermore, not all classes had smart boards or PowerPoint programmes and there were no mathematically designed laboratories. Unlike the idea propagated in national plans that educators are using the wrong teaching methods, participants in this study considered the expectations of departmental plans to be unrealistic. As reported in section 4.4.1 of the previous chapter, participants complained that too many concepts were expected to have been taught within a short period of time. In response to the curriculum requirements, educators were rushing without ensuring that learners had understood the concepts. This situation is worsened by the fact that not all educators are sufficiently knowledgeable to teach both geometry and algebra. Additionally, educator participants explained that the Mathematics workshops they had attended did not yield positive results. The statement is evidenced by the demographic data that clearly shows forty percent of the educator participants teaching Mathematics had only trained to teach Mathematical Literacy.

Poor knowledge of classroom management is a huge concern to the researcher. Research findings indicated that some Mathematics educators who get frustrated by disruptive learner behaviour during instruction, resort to sending learners out of the class, which suggests a lack of classroom management skills. Classroom management is essential for an improvement in learner achievement as has been previously explained in section 2.4.3.1. Most participants admitted their challenges with learner behaviour, yet related literature clearly shows that educators who are knowledgeable in classroom management skills have fewer behavioural concerns (Marquez et al. 2016). Effective classroom management and positive classroom climate construction are essential goals for all teachers (Sieberer-Nagler 2016, p. 163).

Everything that an educator does has implications for classroom management. It is recommended that schools organise staff development programmes apart from the workshops by the Department of Education which focus more on subject content than on professional skills.

5.2.5 Which elements should be included in a model for effective classroom management?

In analysing this study, the researcher was able to select the elements that can be included in a classroom management model as a result of research literature combined with analysis of the research data. The classroom model, shown as Figure 5.1 below may be used by an educator as a guide to create, restore, or maintain a well-managed classroom environment suitable for instruction delivery for the improvement in Mathematics education. The following elements are discussed: resources, educator characteristics, skills, knowledge and self-efficacy as well as a sound communication system.

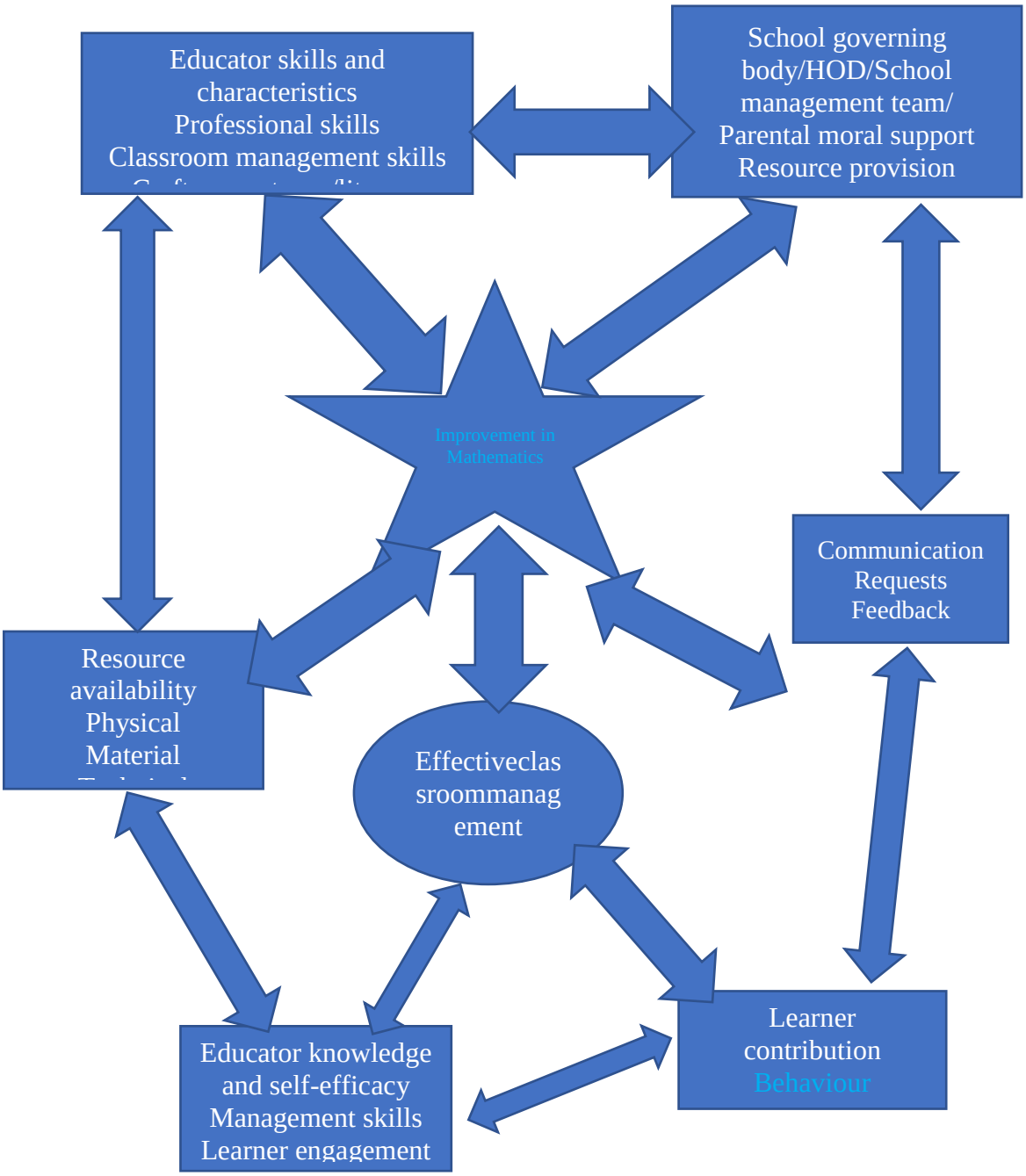

Figure 5.1: Elements of a classroom management model

5.2.5.1 Resource availability

Availability of relevant and adequate physical resources is critical for effective classroom management. Well-equipped classrooms need materials such as textbooks, worksheets, stationery items, geometrical mathematical sets, charts, group work cards and any other audio-visual teaching–learning materials, as well as technical resources like smart boards, computers or overhead projectors. Lack of resources results in challenges when managing Mathematics classes. The Mathematics educator should therefore ensure that there are sufficient physical, material and technical resources.

5.2.5.2 Educator skills and characteristics

Relevant educator skills and characteristics determine, to a large extent, the effectiveness of classroom management. As discussed in the previous sections of this chapter, the Mathematics educator needs professional skills for the management of the classroom, specifically skills in planning, executing the plan, time management, and decision-making, so as to restore and maintain positive behaviour in the classroom or to identify which management style to use in a particular circumstance. The Mathematics educator must be approachable, a good communicator, dedicated, friendly, goal-driven, hardworking, confident, eager to learn, patient and a motivator. Mathematics is a challenging subject; therefore, the educator must possess the skills and characteristics to encourage learners to develop a positive attitude towards the subject.

5.2.5.3 Learner contribution

Learner contribution forms a vital element of a classroom management model. When learners contribute positively towards the classroom activities, management becomes easier and more beneficial to Mathematics education. When learners continuously misbehave, the educator can source assistance from the parents or the school management board. Learners' involvement in some decision-making, such as with the formulation of classroom rules, can result in the improvement of interpersonal relationships which enhances a warm and positive climate for effective classroom management. Furthermore, good educator skills, characteristics and educator subject knowledge can contribute towards positive learner participation and respect for peers as well as for the educator.

5.2.5.4 Educator subject knowledge and self-efficacy

In order to effectively employ the skills, the educator must have a sound content knowledge of the subject. As such, an educator with a strong knowledge base is more confident, patient and

ready to assist than one who has insufficient mathematical knowledge. The educator will have to encourage learner participation as much as possible. During the research study the researcher came to understand that an educator who is comfortable with what is to be taught plans better, makes better decisions, and always gives interesting lesson presentations as opposed to an educator who lacks knowledge. The more experienced a Mathematics educator is, the easier and more effective class management becomes. Hence, relevant and sufficient mathematical knowledge, and educator self-efficacy, are critical elements for a Mathematics classroom management model.

5.2.5.5 Communication

A sound communication network forms as essential part of the classroom management model. The Mathematics educator must be a good communicator with all parties involved such as learners, the school support system, and the community at large. It is vital to involve learners in some decision-making areas such as creating classroom rules or duty rosters. Learners' progress, participation, and motivation during class relies heavily on the nature of the educator's communication. Colleagues and the school management also provide support during the various classroom activities for instance, provision of classroom furniture, maintaining the physical facilities, provision of teaching and learning materials.

A good communication base must be created and maintained with parents and the community at large. Parents provide most of the support that prepares a learner to be ready for instruction. This includes moral support, materials and assist in shaping the general behaviour of the learner which in turn reflects how the classroom discipline. Parents then need feedback on what transpires in the classroom, and they deserve to be informed of their children's progress. The educator's communication skills are displayed through planning, interpreting, executing plans, decision-making or effective application of relevant management skills. In providing and maintaining financial, material and technical resources, parents and the school management unit also need clear communication and feedback from the educator.

5.3 RECOMMENDATIONS

In concluding this study, it is important to note that recommendations are being made in consideration that qualitative research findings may not be generalised to the wider population.

However, these research findings have yielded sufficient and detailed descriptions that may be used to confirm similar contexts. Hence, the research serves to add to the existing knowledge base of educational research. As such, the researcher makes the following recommendations for future studies, current practice and curriculum implementation:

1 The Gauteng DBE needs to provide more classrooms which are mathematically equipped in order to curb overcrowding and the insufficiency of resources currently being experienced in most schools. There is currently no space even to walk about in some Mathematics classrooms. Research findings reveal that in some cases, learners are sharing a single chair or desk, and that there are no Mathematics laboratories in most schools.

2 Mathematics educators should be consulted when drafting the ATP in order to ensure a practical and relevant curriculum for proficient implementation in schools. Involvement of educators will assist in creating a curriculum that is easy to understand and implement. The involvement of Mathematics educators in the ATP would bring them confidence to enable them not to worry about what to teach, but to concern themselves with how to teach in a more relevant way so that learners learn significantly and simultaneously develop the skills, attitudes and values needed in the world they are going to find themselves in.

3 Well-organised workshops need to be made available timeously to Mathematics educators to equip and update them with the relevant skills and knowledge for effective classroom management. The quality of Mathematics educators can improve as a result of such workshops which enhance the undeniably powerful relationship between teacher quality and learner achievement in education (Kane, Taylor, Tyler & Wooten, 2011). These workshops will also give Mathematics educators increased confide in their teaching skills.

4 The current promotional mark of thirty percent for Grade ten up to Grade 12 which is classified as Further Education and Training (FET) phase should be increased to fifty percent in order to encourage a better learner work ethic and an improvement in the quality of Mathematics results. In this regard, learners will need to put in extra effort so as to attain the minimum promotional mark.

5 Support services should be conveniently placed, for instance, a psychologist per school, in order to immediately attend to learners' emotional needs, which in turn will promote learners' focus and concentration during instruction time. The ready

availability of support services in each school would ensure immediate provision of solutions when a need arises.

6 Relevant authorities in schools need to have applicable and uniform behaviour modification interventions, which should be made public and enforced by all schools. School or classroom policies will then be the same, and already known to learners before they can be admitted into schools. Learners who transfer from one school to another will then continue with the same basic rules or principles as the previous school.

7 Favourable and workable policies must be made available which incorporate both the educator's and the learners' needs. Currently, educators appear to have no rights as learner rights are the only ones enforced. Research findings indicated that some Mathematics educators feel insecure and threatened. Hence policies in favour of both parties are needed, to curb abusive scenarios in schools.

8 Classroom management should be considered as a key component of all teacher preparation programmes and should therefore be taught as a standalone course within university teacher education programmes. Classroom management enables the educator to effectively employ multifaceted actions so as to create, support, and facilitate the goals of instruction and learning in the classroom, as well as maintaining an operative learning environment.

9 The school governing body and the school management team should be readily available to immediately support Mathematics educators with finding solutions to referred challenges during instruction time. Examples of such challenges are continuous disruptive learner behaviour or a sudden unexpected illness. The responsible authorities would also be of great assistance in circumstances where the educator fails to communicate with a parent, or when there is a need to conduct a meeting with a parent.

10 It is suggested that responsible authorities need to take into cognisance that Mathematics is a different subject from Mathematical literacy.

11 Finally, after analysing the research findings in relation to the relevant literature, the researcher suggests that Mathematics educators in Gauteng province need to employ a model of classroom management which simplifies the attainment of effective classroom management skills.

5.4 DELIMITATIONS AND LIMITATIONS

5.4.1 Delimitations

The study was confined to selected schools in the Gauteng province, specifically English medium secondary schools. The findings potentially explained what could be occurring in some and not all secondary school settings as far as effective classroom management in relation to improvement in Mathematics education is concerned. The study was also conceptually limited by organising the findings thematically.

5.4.2 Limitations

Several limitations were experienced in this research. The study was limited to only four urban secondary schools in the Gauteng province focusing primarily on exploring the experiences and perceptions of Mathematics educators and Mathematics HODs of participating schools. The research focused on interviewing Mathematics educators without a specific criterion to select participants based on experience, age or qualification. Furthermore, the data collection excluded views of learners as well as parents' which could have improved the rigour of the research study. Furthermore, one of the HOD participant failed to arrive for the scheduled interview.

A further limitation was that the research was conducted in four secondary schools with different environments. The researcher observed that school B is situated in a more affluent area and the majority of its learners are living in much better social and economic conditions than those of schools A, C and D which are located in high density areas. Differences in the resource availability was observed. At school B, similar posters were observed displayed on the classroom walls. Furniture at school B was well arranged confirming a lower number of learners per class unlike in the other school D where desks the chairs had no specific arrangement.

While carrying out the research study, the researcher experienced more limitations as explained below:

1 Financial constraint were experienced since the researcher had to travel to various schools in Gauteng province in order to first make appointments and then to

collect data. In most cases the researcher had to visit each school three or four times in order to carry out a focus group discussion then on a different day to interview the Mathematics head of department (HOD). Extensive and expensive paper work was necessary when collecting and documenting data. Such expenses are frequently apparent in qualitative research studies (Flick 2009). As way of minimising costs, the researcher purposively and conveniently selected schools to participate in the research study within a local radius.

2 Time management was a critically important aspect of this study. In order to accomplish the given focus of study, the researcher had to formulate a strict time schedule that was adhered to. Managing time was a challenge, however, as some unforeseen circumstances required immediate attention, for instance illness, bereavement, work requirements and household chores.

3 A lack of cooperation from some participants was found to be another limitation. Other participants appeared not be sufficiently objective or open-minded to give the expected detailed responses. Some focus group participants dominated discussions while others were reserved and not actively participating. The researcher therefore had to employ probing techniques in order to reach the point of data saturation. Some Mathematics HODs were difficult to contact for the face-to-face semi-structured interviews. In some instances, set appointments were cancelled and had to be reset.

An additional limitation was the omission of classroom observation as a data collection tool to observe the actual teacher-pupil ratio and establish how educators are managing their classrooms. The classroom lesson observation could have increased the collection of first-hand data to enhance reliability and dependability of the research findings. Furthermore, Omission of characteristics such as age, qualification as a guide to participate sis a limitation to rich and reliable data Research findings presentation was carried out as a workshop per school involving all participants. Specific issues could have been cross checked per question and not as themes.

5.5 FUTURE RESEARCH

This study has indeed brought to light a number of issues pertaining to the place and role of effective classroom management of Mathematics classes aimed at improving Mathematics education. The study has explored participant feelings, experiences and perceptions. It is

recommended that future studies should investigate the practical component of classroom management by observing Mathematics lessons thereby understanding classroom management and how it impacts on the improvement of education in a natural setting. Future researchers are also advised to include learners' views as well as accommodating learner and parental feelings in order to strengthen data dependability. In addition, the researcher advises future researchers to utilise only experienced and Mathematically qualified educators when sampling for participants in order to enhance credibility and trustworthiness of research findings. As such, classroom management will in turn maximise learning, while simultaneously minimise classroom misconduct such as disruptive to learning.

5.6 CONCLUSION

In this chapter, the researcher discussed the overview of the preceding chapters and highlighted related literature. The researcher also concluded the chapter by discussing research findings, limitations and recommendations for future studies. Elements which should be included in the formulation of a classroom model were highlighted. The chapter was then concluded by discussing possible future studies in relation to the research topic.

The broad conclusions drawn from this study are summarised as follows:

1 The classroom management styles in Mathematics teaching are variably utilised and simultaneously determined by various factors such as the educator knowledge, experience, goal to be achieved, availability of resources, learner behaviour as well as class size.

2 Adequate and relevant physical, technical, and material resources are critical elements of a classroom management strategy. Some schools in Gauteng province are overcrowded, while technical and material resources are inadequate in most schools. There are no mathematical laboratories and most classes do not have smart boards installed.

3 Some educators who are qualified to teach Mathematical Literacy are teaching Mathematics thus posing an educator lack of sufficient mathematical knowledge leading them to struggle with mathematical topics such as geometry.

4 Mathematics educators are faced with numerous challenges such as a high teacher to pupil ratio, lack of the above-mentioned resources, and disciplinary problems. However, regardless of challenges being faced Mathematics educators are encouraged to be creative, patient, accommodative, motivating in order to reduce the common anxiety associated with the subject.

More research is recommended, in order to fully comprehend what happens in the classroom. The researcher gained insight related to the employment of various strategies for effective classroom management. This was made possible through analysis of the lived experiences and feelings of the educator participants and from observations during the data generation process. The findings of this research study clearly indicate that effective classroom management is critical for the improvement of Mathematics education.

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APPENDICES

APPENDIX A: PERMISSION LETTER TO CARRY OUT RESEARCH; GAUTENG DEPARTMENT OF EDUCATION.

REQUESTING PERMISSION LETTER TO CONDUCT RESEARCH

RESEARCH TITLE: The place and role of effective classroom management in the improvement of Mathematics education in Gauteng province.

28 May 2017

Contact Person's name: Abigail Juta

40 The Pines Complex

Jean Avenue

Centurion

Pretoria

0157

Contact mobile number: 0027797803883

Email Address: abiejuta@yahoo.com

The Provincial Head

Gauteng Department of Education

Head Office

South Africa

Dear Sir

I Abigail Juta am doing research under the supervision of Professor Chris Van Wyk who is a professor in the Department of Education Management towards a Doctoral degree in Education specialising in Education Management at the University of South Africa. I am funding my studies. I am therefore requesting your permission to carry out research at selected two high schools in Gauteng Province. The study which I have registered to carry out is entitled: *The place and role of effective classroom management in the improvement of Mathematics education in Gauteng province.*

The aim of this study is to explore and investigate the place and role of effective classroom management for the improvement of Mathematics education. The intention is to find out whether there is a co-relation between effective classroom management and improved Mathematics education.

I wish to acknowledge that I am familiar with the UNISA research policy and the UNISA ethics policy. Attached to this application please find my research plan, CV and a copy of the UNISA ethical clearance certificate. I would like to thank you in advance for granting me permission to conduct my research.

The schools have been selected purposively and for convenient reasons. The researcher will be able to collect detailed data without a lot of travelling to distant places. It will also save on time and financial expenses.

The study will entail collecting data through interviewing the head of Mathematics department in addition to the focus group discussion which will comprise of Mathematics educators as participants per school. Data will also be collected through observation simultaneously during the interview meeting as well as the focus group discussion.

Furthermore, data may also be collected from minutes of meeting, record of marks and any handouts from the principal or head of department if made available.

There are no foreseeable risks but participants may be inconvenienced on time as they need to spare their time while responding to researcher's request. Names of participants will not be disclosed. This implies that, there are more benefits and no risks in participating. It is hoped that, the adult only participants as Mathematics educators will understand more the importance of effective classroom management which when correctly employed will in turn lead to an improvement of Mathematics education.

Participation will be voluntary and those involved can withdraw their involvement at any time. The researcher will try to stick to the time schedules agreed and prolonging will be avoided where possible. The researcher anticipates collecting data after the academic day in order to minimise academic schedules in schools. The data collected will be used only for the purpose of this research then securely stored at UNISA University for five years. Future use of the stored data will be subject to further Research Ethics Review and approval if applicable. If need arises to destroy the stored data, hard copies will be shredded while relevant software will be used to destroy soft copies.

The researcher will arrange a workshop involving all the participants per school, within a month after completing the research in order to provide feedback on the research findings. Results of the study may be made available at any time and may be viewed following some set rules and regulations.

Yours Sincerely

Abigail Juta

APPENDIX B: LETTER OF REQUEST TO CONDUCT RESEARCH: PRINCIPAL

REQUESTING PERMISSION LETTER TO CONDUCT RESEARCH

RESEARCH TITLE: The place and role of effective classroom management in the improvement of Mathematics education in Gauteng province.

28 May 2017

Contact Person's name: Abigail Juta

40 The Pines Complex

Jean Avenue

Centurion

Pretoria

0157

Contact mobile number: 0027797803883

Email Address: abiejuta@yahoo.com

The Principal

Dear Sir

I Abigail Juta am doing research under the supervision of Professor Chris Van Wyk who is a professor in the Department of Education Management towards a Doctoral degree in Education specialising in Education Management at the University of South Africa. I am funding my studies. I am therefore inviting you to participate in a study entitled: *The place and role of effective classroom management in the improvement of Mathematics education in Gauteng province.*

The aim of this study was to explore and investigate the place and role of effective classroom management for the improvement of Mathematics education. The intention is to find out whether there is a co-relation between effective classroom management and improved Mathematics education.

I wish to acknowledge that I am familiar with the UNISA research policy and the UNISA ethics policy. Attached to this application please find my research plan, CV and a copy of the UNISA ethical clearance. I would like to thank you in advance for granting me permission to conduct my research at Lyttelton Manor High School.

The schools have been selected purposively and for convenient reasons. The researcher will be able to collect detailed data without a lot of travelling to distant places. It will save on time and financial expenses.

The study will entail collecting data through a 60-minute interview with the head of Mathematics department. A 90-minute focus group discussion will also be carried out with Mathematics educators as participants per school. Data will also be collected through observation during the interview meeting as well as the focus group discussion. Furthermore, data may also be collected from minutes of meeting, record of marks and any handouts from the principal, head of department or educators if made available.

There are no foreseeable risks but participants may be inconvenienced on time as they need to spare their time while responding to researcher's request. Names of participants will not be disclosed. This implies that, there are more benefits and no risks in participating. It is hoped that participants will understand more the importance of effective classroom management which will in turn lead to an improvement of Mathematics education.

Participation will be voluntary and those involved can withdraw their involvement at any time. The researcher will try to stick to the time schedules agreed and prolonging will be avoided where possible. The data collected will be used only for the purpose of this research then securely stored at UNISA for five years.

Future use of the stored data will be subject to further Research Ethics Review and approval if applicable. If need arises to destroy the stored data, hard copies will be shredded while relevant software will be used to destroy soft copies. The researcher will arrange a workshop involving all participants per school, within a month after completing the research in order to

provide feedback on the research findings. Results of the study may be made available and may be viewed following some rules and regulations.

Yours Sincerely

Abigail Juta

APPENDIX C: PARTICIPANT INFORMATION SHEET: MATHEMATICS HEAD OF DEPARTMENT

PARTICIPANT INFORMATION SHEET

29 May 2017

Contact person's details: Abigail Juta

40 The Pines Complex

Jean Avenue

Centurion

Pretoria

0157

The Head of Mathematics Department

Lyttelton Manor High School

Selbourne Street

Lyttelton

Research Topic: The place and role of effective classroom management in the improvement of Mathematics education in Gauteng province.

Dear Mathematics Head of Department

My name is Abigail Juta and am doing research under the supervision of Professor Chris Van Wyk who is a professor in the Department of Education Management towards a Doctoral degree in Education specialising in Education Management at the University of South Africa. I am funding my studies. I am therefore inviting you to participate in a study entitled: *The*

place and role of effective classroom management in the improvement of Mathematics education in Gauteng province.

The aim of this study is to explore and investigate the place and role of effective classroom management for the improvement of Mathematics education. The intention is to find out whether there is a co-relation between effective classroom management and improved Mathematics education.

You are being requested to participate in this research because of your wealth of experience in the Education and also because of your position as the head of Mathematics department of Lyttelton Manor High School. I feel you can make significant input to the study. Your school is one of the four high schools that have been selected to participate. Six members at your school are expected to participate as follows, the Mathematics Head of Department (interview) and any five Mathematics educators for focus group discussion. The research study involves the management of Mathematics classes. As such the choice of the Mathematics head of department and Mathematics educators maximise the collection of relevant data.

Copies of supporting documentation are kindly requested for example school rules, classroom rules, minutes of meetings or any other helpful, accessible and non-sensitive documents relating to classroom management. The study collects data through interviews, focus group discussions, document analysis and also observation which takes place simultaneously during the interview and focus group discussions.

You will be requested to participate in a 60-minute interview with the guiding interview questions as reflected on the attachment, focus group 90 minutes. Document analysis will need about 2 hours and may not involve your presence.

Participating in this study is voluntary and you are under no obligation to consent to participation. If you decide to take part, you will be given this information sheet to keep and be asked to sign a written consent form. You are free to withdraw at any time and without giving reasons for your withdrawal.

The benefit of participation will be the improvement in Mathematics results upon the implementation of effective classroom management. On the other hand, the only inconvenience could be the time sacrificed for the interviews and focus group discussions. I

will try to work within the allocated time so as not to disrupt the smooth running of the school programme.

Your identity and responses will not be disclosed anywhere. Codes will be assigned to the responses. Data collected will be for the sake of this research study only. Strict confidentiality will be adhered to. However, your anonymous data may be used for other purposes, such as a research report, journal articles and/or conference proceedings, but you will not be identifiable in such reports.

Hard copies of your responses will be kept in a secure cabinet at the researcher's home for academic purposes for a period of 5 years. Soft copies will be kept on the computer hardware drive and a secret password will be used to ensure that no one will have access to the data. Future use of the stored data will be subject to further Research Ethics Review and approval if applicable. If need arises to destroy the stored data, hard copies will be shredded while relevant software will be used to destroy soft copies.

Please note that no payment will be given as a reward for participating. Furthermore, you are not expected to incur any financial costs, however if you by any chance incur any financial expense/loss as a result of this study, reimbursement will be immediately arranged by the researcher.

This study has already received a written approval from the Research Ethics Review Committee of the College of Education, UNISA. A copy of the approval letter can be obtained from the researcher anytime upon request.

A workshop involving all participants per school will be arranged within a month soon after completing the research in order to give feedback based on the research findings. However, if you would like to be informed of the final research findings individually, please feel free to contact Abigail Juta mobile number 0027797803883 or email address: abiejuta@yahoo.com.

Should you have concerns about the way in which the research has been conducted, you may contact my supervisor Professor Chris van Wyk, at email address: Vanwyk.christo1@gmail.com. Alternatively, contact the research ethics Chairperson of the College of Education, Dr MadaleenClaassens (mcdtc@netactive.co.za), +27 12 346 0701.

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

Thank you.

Regards

Abigail Juta

APPENDIX F: INTERVIEW GUIDING QUESTIONS FOR THE MATHEMATICS HEAD OF DEPARTMENT

Research Topic: The place and role of effective classroom management in the improvement of Mathematics education in Gauteng province.

1 Explain the management style that can be used in Mathematics classrooms in:

*Teaching

-

*Self-study

-

*Checking of homework

*Assessments

-

*The maintenance of discipline

2 Do you regard any of the following as challenges in effectively managing Mathematics classrooms?

the availability of physical facilities (eg. Laboratory and computers)

*class size

*seating arrangements

-

*furniture arrangements and displays

3. In setting classroom policies and rules, what is the influence of the:

   *Curriculum,
   *Time-tabling and
   *The active involvement of learners?

4. How does communication and motivation relate to the classroom climate?

5. In your own opinion, give the relative importance between external induced assessment and internal grading as forms of classroom management.

6. When supervising Mathematics educators, what challenges are they facing in managing their classes?

7. What measures are in place to curb the challenges of effectively managing Mathematics classrooms?

8. How helpful is classroom rules and the Mathematics departmental policy in effectively managing classrooms?

9. How is the school supporting educators in managing their classes?

10. Are there any suggestions for effectively managing Mathematics classrooms?

APPENDIX D: PARTICIPANT INFORMATION SHEET: FOCUS GROUP

PARTICIPANT INFORMATION SHEET

29 May 2017

Contact person's details: Abigail Juta

40 The Pines Complex

Jean Avenue

Centurion

Pretoria

0157

The Mathematics Educators (Focus Group Participants)

Research Topic: The place and role of effective classroom management in the improvement of Mathematics education in Gauteng province.

Dear Mathematics Educator Participants

My name is Abigail Juta and am doing research under the supervision of Professor Chris Van Wyk who is a professor in the Department of Education Management towards a Doctoral degree in Education specialising in Education Management at the University of South Africa. I am funding my studies. I am therefore inviting you to participate in a study entitled: *The place and role of effective classroom management in the improvement of Mathematics education in Gauteng province*.

The aim of this study is to explore and investigate the place and role of effective classroom management for the improvement of Mathematics education. The intention is to find out whether there is a co-relation1. between effective classroom management and improved Mathematics education.

You are being requested to participate in this research because of your wealth Mathematical knowledge and teaching experience in High School Mathematics. I feel you can make significant input to the study. Your school is one of the four high schools that have been selected to participate. Five educators at your school are expected in the focus group discussion. The research study involves the management of Mathematics classes. As such the choice of the Mathematics educators maximise the collection of relevant data.

Copies of supporting documentation are kindly requested for example school rules, classroom rules, minutes of meetings or any other helpful, accessible and non-sensitive documents relating to classroom management. The study collects data through interviews, focus group discussions, document analysis and also observation which takes place simultaneously during the interview and focus group discussions.

You will be requested to participate in a 90- minute focus group discussion at a venue as allocated by the school's responsible authorities. Focus group discussion involves the collection of data that through non-formal interaction between the researcher with more than one participant of common characteristics in a free atmosphere that enables probing and learning from each other's contribution. A guiding focus group protocol is reflected on the attachment. Document analysis will need about 2 hours and may not involve your presence.

Participating in this study is voluntary and you are under no obligation to consent to participation. If you decide to take part, you will be given this information sheet to keep and be asked to sign a written consent form. You are free to withdraw at any time and without giving reasons for your withdrawal.

The benefit of participation will be potential of adding value and forming part of existing knowledge base. Participating Mathematics educators will therefore learn from each other more strategies of managing their classrooms. It is hoped that the implementation of effective classroom management will enhance an improvement in Mathematics results.

On the other hand, the only inconvenience could be the time sacrificed for the focus group discussions. I will try to work within the allocated time after school so as not to disrupt the smooth running of the school programme.

Your identity and responses will not be disclosed anywhere. Codes will be assigned to the responses. Data collected will be for the sake of this research study only. Strict confidentiality will be adhered to. However, your anonymous data may be used for other purposes, such as a

research report, journal articles and/or conference proceedings, but you will not be identifiable in such reports.

Hard copies of your responses will be kept in a secure cabinet at UNISA for academic purposes for a period of 5 years. Soft copies will be kept on the computer hardware drive and a secret password will be used to ensure that no one will have access to the data. Future use of the stored data will be subject to further Research Ethics Review and approval if applicable. If need arises to destroy the stored data, hard copies will be shredded while relevant software will be used to destroy soft copies.

Please note that no payment will be given as a reward for participating. Furthermore, you are not expected to incur any financial costs, however if you by any chance incur any financial expense/loss as a result of this study, reimbursement will be immediately arranged by the researcher.

This study has already received a written approval from the Research Ethics Review Committee of the College of Education, UNISA. A copy of the approval letter can be obtained from the researcher anytime upon request.

A workshop involving all participants per school will be arranged within a month after completing the research in order to give feedback based on the research findings. However, if you would like to be informed individually of the final research findings, please feel free to contact Abigail Juta mobile number 0027797803883 or email address: abiejuta@yahoo.com.

Should you have concerns about the way in which the research has been conducted, you may contact my supervisor Professor Chris van Wyk, at email address: Vanwyk.christo1@gmail.com. Alternatively, contact the research ethics Chairperson of the College of Education, Dr MadaleenClaassens (mcdtc@netactive.co.za), +27 12 346 0701.

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

Thank you.

Abigail Juta

APPENDIX G: GUIDING QUESTIONS FOR THE FOCUS GROUP

Research Topic: The place and role of effective classroom management in the improvement of Mathematics education in Gauteng province

1 Which are the main teaching activities that should be performed and managed in Mathematics classrooms?

2 How important is the use of a computer laboratory in managing Mathematics classrooms?

3 Which activities (other than teaching) should be managed in Mathematics classrooms?

4 How should the different grading and assessment tasks be balanced and managed in a classroom?

5 How is effective classroom management related to Mathematics education?

6 Can leadership styles be utilised when teaching Mathematics, if so how?

7 Which classroom rules/ strategies do you employ for effective management of Mathematics classes?

8 How do you manage unwanted behaviour during a Mathematics lesson?

9 Which motivational strategies do you employ during a Mathematics lesson?

10 How is your school supporting effective management of Mathematics classes?

11 In your own opinion, what would you consider as the characteristics of an effective Mathematics educator?

12 How often do you give assessment tasks and how long does it take you to provide feedback?

13 What challenges are educators facing when managing Mathematics classrooms and

how can the challenges be addressed?

14 Are there any suggestions for effectively managing Mathematics classrooms?

APPENDIX H: OBSERVATION CHECK LIST

Research Topic: The place and role of effective classroom management in the improvement of Mathematics education in Gauteng province.

Views of Head of Departments and teachers on preferred Classroom Management Style.

The influence and general appearance of facilities (eg. Computer rooms) on effective teaching.

Co-operation and joint grading between teachers of Mathematics tests and examinations

Importance of communication and motivation by teachers

Non-verbal cues

1. Observer needs to be watchful and see if the participant looks at you when discussing or facing elsewhere showing no interest or concern about what is happening or an expression of surprise.

2. Hand signals: Some participants during focus group discussion may be raising up hands in order to be given a chance to participant. Hands may be flown in anger or may be utilised to invite so as to be shown something.

3. Body language; Some body language may show impatience, patience or eager to contribute.

4. Smile/laugh: The researcher will have to note whether its mockery in nature, negatively influencing, positively influencing or mere excitement/amusement. Friendly smile or not

5. Classroom appearances; Is the classroom clean and well organised

6. Dressing; Is the educator descent and professionally dressed.

7. Displays; Are there mathematical visual aids, classroom rules where all learners see and timeously be reminded, any motivational posters, projectors?

8. Seating arrangement of learners, positioning of educator desk

Verbal cues:

1. Voice projection: Is it friendly, harsh, sensitive to ethical consideration eg racism?

2. Are responses being rushed or in detail?

3. Are responses subjective or objective?

APPENDIX E: PARTICIPANT CONSENT FORM

PARTICIPANT CONSENT FORM

May you please complete the Demographic data as required below by Indicating:

1. Sex: Male Female

2. Age Group: 20-29 30-39 40-49 50-59 60+

2. Position: Educator Head of Department Principal

3. Teaching Subjects of Speciality

-

4. Subjects currently being taught

5. Years of experience teaching Mathematics

-

CONSENT TO PARTICIPATE IN THIS STUDY (Reply Slip)

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, there is no reward 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 processed into a research report, journal publications and/or conference proceedings, but that my participation will be kept strictly confidential unless otherwise specified.

I agree to the recording of the interview on my views in response to questions on the role and place of classroom management for the improvement of Mathematics education in Gauteng Province.

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

Participant Name & Surname (please print):

_____

Participant Signature:

_____

Date:

Researcher's Name & Surname (please print):

Abigail Juta

_____

Researcher's signature:

_____

Date:

_____

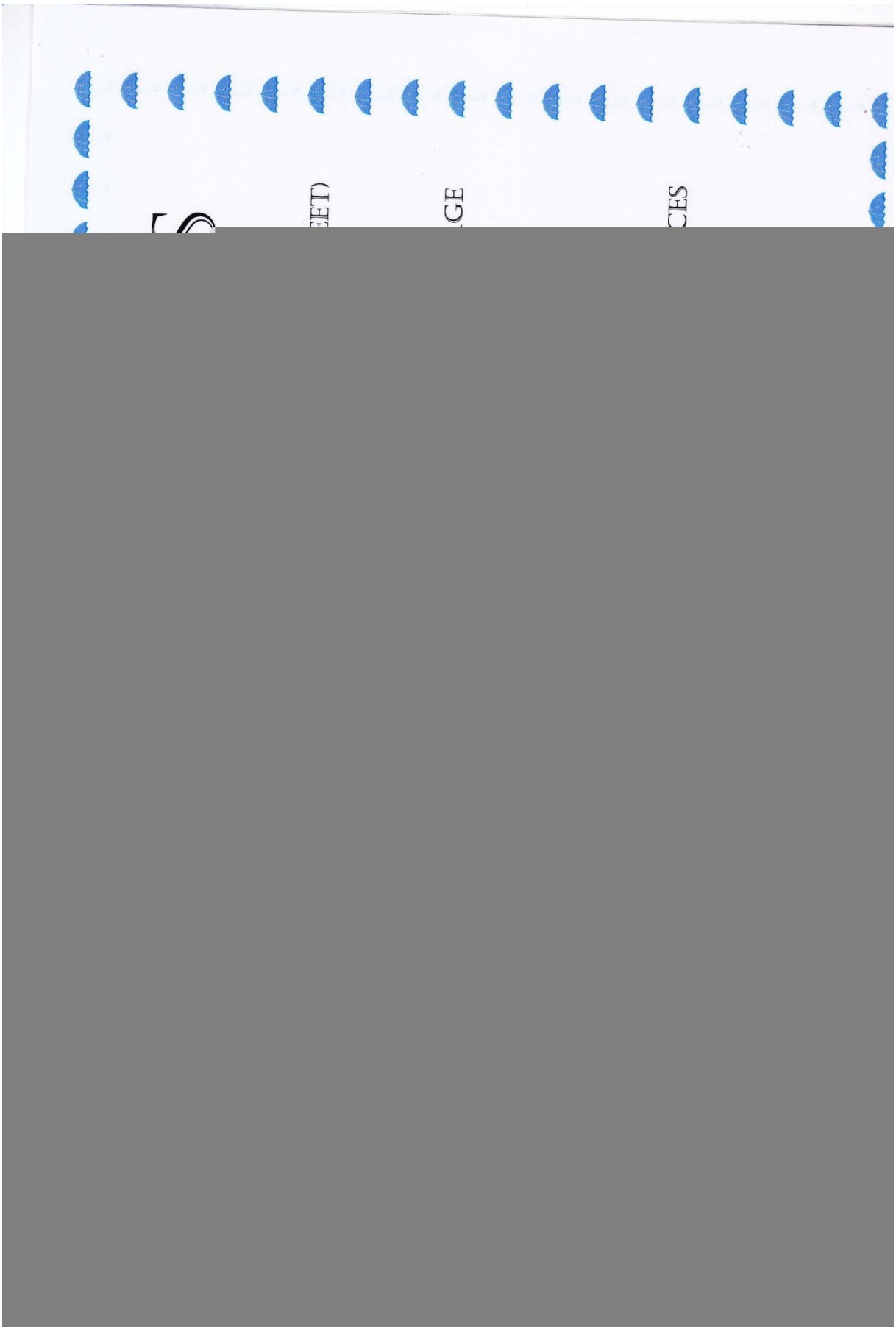
APPENDIX I: ANNUAL TEACHING PLAN

GAUTENG PROVINCE

GAUTENG PROVINCE
MATHEMATICS – ANNUAL TEACHING PLAN –GRADE 10
2018

DATE	TOPIC	CONTENT	F	ASSESSMENT	DATE Completed	% Completed
TERM 1				**2 TASKS FOR TERM 1**		
17/1 – 19/1 (3 days)	Algebraic expressions	• Understand that real numbers can be rational or irrational. • Establish between which two integers a given simple surd lies.				3%
22/1 – 26/1	Algebraic expressions	• Round real numbers to an appropriate degree of accuracy • Revise multiplication of a binomial by a binomial. • Multiplication of a binomial by a trinomial. • Factorisation: Difference of two squares Common factors.				6%
29/1 – 02/2	Algebraic expressions	• Factorisation: Trinomials Grouping in pairs. Sum and difference of two cubes. • Algebraic fractions: Denominator with monomial, binomial and trinomial terms. (limited to sum & difference of cubes).				9%
05/2 – 09/2	Algebraic expressions	• Algebraic fractions: Denominator with monomial, binomial and trinomial terms. (limited to sum & difference of cubes).	F	**TEST** **SBA marks: 10**		12%
12/2 – 16/2	Exponents	• Revise laws of exponents where x,y> 0 and m,n∈Z. • $x^m \times x^n = x^{m+n}$ • $x^m \div x^n = x^{m-n}$ • $(x^m)^n = x^{mn}$ • $x^m \times y^m = (xy)^m$ Also by definition: • $x^{-n} = \frac{1}{x^n}, x \neq 0$,and $x^0 = 1, x \neq 0$. • Use the laws of exponents to simplify expressions and solve equations, accepting that the rules also hold for,n∈Q.				15%
19/2 – 23/2	Exponents	• Use the laws of exponents to simplify expressions andsolve equations, accepting that the rules also hold for,n∈Q • Exponential equations.				18%
26/2 – 02/3	Number patterns	• Investigate number patterns leading to those where there is a constant difference between consecutive terms, and the general term is therefore linear. **WITHOUT USING A FORMULA**				21%
05/3 – 09/3	Equations	• Linear equations. • Quadratic equations (by factorisation).				24%
12/3 – 16/3	Equations and Inequalities	• Literal equations (change the subject of the formula). • Simultaneous linear equations in two unknowns. • Solve linear inequalities (show solutions graphically).	F	**TEST** **SBA marks: 10**		27%
19/3 – 23/3 (4 days)	Equations and Inequalities	• Solve linear inequalities (show solutions graphically). • Interval notation must be known. • Word problems involving linear, quadratic or simultaneous linear equations.				30%
26/3 – 28/3 (3 days)	Euclidean Geometry	• Revise basic results established in earlier grades: lines, angles, congruency, similarity. • Revise theorem of Pythagoras and properties of Quadrilaterals				33%
END OF TERM 1 SCHOOLS CLOSES ON THE 28/03/2018						

APPENDIX J: CLASSROOM RULES



APPENDIX K: GDE RESEARCH FORM

GAUTENG PROVINCE
Department: Education
REPUBLIC OF SOUTH AFRICA

GDE RESEARCH REQUEST FORM

REQUEST TO CONDUCT RESEARCH IN INSTITUTIONS AND/OR OFFICES OF THE GAUTENG DEPARTMENT OF EDUCATION

1. PARTICULARS OF THE RESEARCHER

1.1	Details of the Researcher
Surname and Initials:	Juta. A
First Name/s:	Abigail
Title (Prof / Dr / Mr / Mrs / Ms):	Ms
Student Number (if relevant):	44744196
ID Number:	6910291107187

1.2	Private Contact Details
Home Address	Postal Address (if different)
40 The Pines Complex	
Jean Avenue	
Centurion	
Pretoria	

Postal Code: 0157	Postal Code:
Tel: 0126645698	
Cell: 0797803883	
Fax:	
E-mail: abiejuta@yahoo.com	

2. PURPOSE & DETAILS OF THE PROPOSED RESEARCH

2.1	Purpose of the Research (Place cross where appropriate)
Undergraduate Study - Self	
Postgraduate Study - Self	X
Private Company/Agency – Commissioned by Provincial Government or Department	
Private Research by Independent Researcher	
Non-Governmental Organisation	
National Department of Education	
Commissions and Committees	
Independent Research Agencies	
Statutory Research Agencies	
Higher Education Institutions	

2.2	Full title of Thesis / Dissertation / Research Project
	The place and role of effective classroom management in the improvement of Mathematics education in Gauteng province.

2.3	Value of the Research to Education (Attach Research Proposal)
	The improvement in Mathematics Education as an attempt to curb the poor performance in the respective subject.

2.4	Proposed date of completion of study / project and submission of research findings to GDE
Completion date:	

Submission to GDE date:	

2.5	Student and Postgraduate Enrolment Particulars (if applicable)
Name of institution where enrolled:	UNISA
Degree / Qualification:	Doctoral degree
Faculty and Discipline / Area of Study:	Education Management
Name of Supervisor / Promoter:	Prof Chris Van Wyk

2.6	Employer (where applicable)
Name of Organisation:	Gauteng Education Department
Position in Organisation:	Educator
Head of Organisation:	Ms P Malherbe
Street Address:	Lyttelton Manor High School
	Selbourne Street. Centurion
Postal Code:	0157
Telephone Number (Code + Ext):	0126645698
Fax Number:	0126645039
E-mail:	manor@mweb.co.za

2.7	PERSAL Number (where applicable)						
2	2	8	7	3	6	2	7

3. PROPOSED RESEARCH METHOD/S

(Please indicate by placing a cross in the appropriate block whether the following modes would be adopted)

3.1 Questionnaire/s (If Yes, supply copies of each to be used)

YES		NO	X

3.2 Interview/s (If Yes, provide copies of each schedule)

YES		NO	X

3.3 Use of official documents

YES	X	NO	
If Yes, please specify the document/s:			
Record of marks, Seating plans, curriculum guideline, demerit records, classroom rules, school policy			

3.4 Workshop/s / Group Discussions (If Yes, Supply details)

YES	X	NO	
Focus group discussions involving Mathematics educators for data collection and another workshop to be arranged within a month after completing the research in order to provide research findings to all participants per school.			

3.5 Standardised Tests (e.g. Psychometric Tests)

YES		NO	X
If Yes, please specify the test/s to be used and provide a copy/ies			

4. INSTITUTIONS TO BE INVOLVED IN THE RESEARCH

4.1 Type of Institutions (Please indicate by placing a cross alongside all types of institutions to be researched)

INSTITUTIONS	Mark with X here
Primary Schools	
Secondary Schools	X
ABET Centres	
ECD Sites	
LSEN Schools	
Further Education & Training Institutions	
Other	

4.2 Number of institution/s involved in the study (Kindly place a sum and the total in the spaces provided)

Type of Institution	Total
Primary Schools	
Secondary Schools	4
ABET Centres	
ECD Sites	
LSEN Schools	
Further Education & Training Institutions	
Other	
GRAND TOTAL	

4.3 Name/s of institutions to be researched (Please complete on a separate sheet if space is found to be insufficient)

Name/s of Institution/s
Lyttelton Manor High School
RibaneLaka High School
TsosolosoYa Afrika High School
Ponelopele Oracle High School

APPENDIX L: PROPOSAL ACCEPTANCE LETTER

NOTICE TO POSTGRADUATE QUALIFICTION SECTION (M&D)

RESULT : RESEARCH PROPOSAL MODULE

STUDENT NAME	Mrs A Juta	**STUDENT NUMBER**	44744196
DEGREE	PhD	**SPECIALISATION**	Education Man

Please indicate the relevant option with an x:

The above student did not comply with the requirements for the research proposal module and may reregister for this module

The above student did not comply with the requirements for the research proposal module and may not continue with his studies for the degree.
Please provide reasons: **. . .**

I confirm that the above student complied with the requirements for the research proposal module (research proposal approved by departmental higher degrees committee) **and may now proceed to register for the research component**. *Please provide details below* X

Title: **The place and role of effective classroom management in the improvement of Mathematics education in Gauteng province**

Supervisor : **C van Wyk** Personnel Number : **52113434**

Highest Qualification: **D Ed**

Signature: **Chris van Wyk**

Date: **11/11/2016**

Approval

Comments: Approved

Signature: 

Date: 11 November 2016

Comments:

Signature :

On behalf of College/School Executive Committee

Date:

FOR OFFICE USE ONLY BY SENIOR QUALIFICATIONS

Result captured (F375)

APPENDIX M: APPROVAL RESEARCH LETTER GDE

GAUTENG PROVINCE

Department: Education REPUBLIC OF SOUTH AFRICA

GDE RESEARCH APPROVALLETTER

Date:	22 September 2017
Validity of Research Approval:	06 February 2017 — 29 September 2017 2017/273
Name of Researcher:	Juta A.
Address of Researcher:	40 THE PINES COMPLEX
	JEAN AVENUE
	CENTURION PRETORIA, 0157
Telephone Number:	0126645698 079 7803883
Email address:	abiejuta@yahoo.com
Research Topic:	The place and role of effective classroom Management in the improvement of Mathematics in Gauteng province
Number and type of schools:	Four Secondary Schools
District/s/HO	Tshwane South

Office of the Director: Education Research and Knowledge Management

7 ' Floor, 17 Simmonds Street, Johannesburg 2001

Tel: (011) 355 0488

\Email: Faith.TshabaIala@gauteng.gov.za

Website: www.education.gpg.gov.za

Re: *Approval in Respect of* Request *to Conduct* Research

This letter serves to indicate that approval is hereby granted to the above-mentioned researcher to proceed with research in respect of the study indicated above. The onus rests with the researcher to negotiate appropriate and relevant time schedules with the school/s and/or offices involved to conduct the research. A separate copy of this letter must be presented to both the School (both Principal and SGB) and the District/Head Office Senior Manager confirming that permission has agreed the research to be conducted.

The following conditions apply to GDE research. The researcher may proceed with the above study subject to the conditions listed below being met. Approval may be withdrawn should any of the conditions listed below be flouted: 1

The District/Head Office Senior Manager/s concerned must be presented with a copy of this letterthatwouldindicatethatthesaidresearcher/shas/havebeengrantedpermissionfromthe Gauteng Department of Education to conduct the research study.

7he*District/Head*Office*SeniorManagersmustbeapproachedseparately*,and*in writing,for permission to involve District:/HeadOffice Officials in the project.*

*Acopyofthisletter*must*beforwardedtotheschoolprincipalandthechairpersonofthe School*

Governing*Body(SGB)thatwouldindicatethattheresearcher/shavebeengranted permission fromtheGautengDepartmentofEducation toconducttheresearchstudy.*

Aletter/documentthatoutlinesthepurposeoftheresearchandtheanticipatedoutcomes of

suchresearchmustbemadeavailabletotheprincipals,SGBsandDistrict/HeadOffiSenior Managers of the schools and districts/offices concerned, respectively.

*The Researcher will make every effort obtain the goodwill and co-operation of all the GDE officials,principals,*and*chairpersonsoftheSGBs,teachersandlearnersinvolved.*

Personswho offertheirco-operationwillnotreceiveadditionalremunerationfromtheDepartmentwhilethose that opt not to participate will not be penalised in anyway.

*Researchmayonlybeconductedafterschoolhourssothatthenormalschoolprogrammeisnot interrupted. The Principal (if at a school) and/or Director (if at a district/head office) must be consultedaboutanappropriatetimewhentheresearcher/smaycarryouttheirresearch*af*the sites that they manage.*

*Research*may*onlycommencefromthesecondweekofFebruaryandmustbeconcludedbefore the beginning of the last quarter of the academic year. If incomplete, an amended Research Approval*letter*mayberequested*toconductresearch*inthefollowingyear.*

Items6and7willnotapplytoanyresearcheffortbeingundertakenonbehalfoftheGDE.Such researchwillhavebeencommissionedandbepaidforbytheGautengDepartmentofEducation.

It is the researcher's responsibility to obtain written parental consent of all learners that are expected to participate in the study.

The researcher is responsible for supplying and utilising his/her own research resources, such as stationery,photocopies,transport,faxesandtelephonesandshouldnotdependonthegoodwill of the institutions and/or the offices visited for supplying suchresources.

The names of the GDE officials, schools, principals, parents, teachers and learners that participateinthestudymaynotappearintheresearchreportwithoutthewrittenconsentofeach of these individuals and/ororganisations.

Oncompletionofthestudytheresearcher/smustsupplytheDirector:Knowledge Management &ResearchwithoneHardCoverboundandanelectroniccopyoftheresearch. Theresearchermaybeexpectedtoprovideshortpresentationsonthepurpose,findings and recommendationsofhis/herresearchtobothGDEofficialsandtheschoolsconcerned. Shouldtheresearcherhavebeeninvolvedwithresearchataschooland/oradistrict:/headoffice level,theDirectorconcernedmustalsobesuppliedwithabriefsummaryofthepurpose,findings and recommendations of the researchstudy.

The District/Head Office Senior Manager/s concerned must be presented with a copy of this letterthatwouldindicatethatthesaidresearcher/shas/havebeengrantedpermissionfromthe Gauteng Department of Education to conduct the researchstudy.

7he*District/Head*Office*SeniorManagerfsmustbeapproachedseparately,*and*in writing,for permission to involve District:/HeadOffice Officials in the project.*

*Acopyofthisletter*must*beforwardedtotheschoolprincipalandthechairpersonoftheSchool* Governing*Body(SGB)thatwouldindicatethattheresearcher/shavebeengranted permission fromtheGautengDepartmentofEducation toconductttheresearchstudy.*

Aletter/documentthatoutlinesthepurposeoftheresearchandtheanticipatedoutcomes of suchresearchmustbemadeavailabletotheprincipals,SGBsandDistrict/HeadOfficeSenior Managers of the schools and districts/offices concerned,respectively.

*The Researcher will make every effort obtain the goodwill and co-operation of all the GDE officials,principals,*and*chairpersonsoftheSGBs,teachersandlearnersinvolved.*

Personswho offertheirco-operationwillnotreceiveadditionalremunerationfromtheDepartmentwhilethose that opt not to participate will not be penalised in anyway.

*Researchmayonlybeconductedafterschoolhourssothatthenormalschoolprogrammeisnot interrupted. The Principal (if at a school) and/or Director (if at a district/head office) must be consultedaboutanappropriatetimewhentheresearcher/smaycarryouttheirresearch*at*the sites that theymanage.*

*Research*may*onlycommencefromthesecondweekofFebruaryandmustbeconclu dedbefore the beginning of the last quarter of the academic year. If incomplete, an amended Research Approval*letter*mayberequested*toconductresearch*inthefollowingyear.*

Items6and7willnotapplytoanyresearcheffortbeingundertakenonbehalfoftheG DE.Such

researchwillhavebeencommissionedandbepaidforbytheGautengDepartmento fEducation.

It is the researcher's responsibility to obtain written parental consent of all learners that are expected to participate in the study.

The researcher is responsible for supplying and utilising his/her own research resources, such as stationery,photocopies,transport,faxesandtelephonesandshouldnotdependont hegoodwill of the institutions and/or the offices visited for supplying suchresources.

The names of the GDE officials, schools, principals, parents, teachers and learners that participateinthestudymaynotappearintheresearchreportwithoutthewrittencon sentofeach of these individuals and/ororganisations.

OncompletionofthestudytheresearcherʼsmustsupplytheDirector:Knowledge Management

&ResearchwithoneHardCoverboundandanelectroniccopyoftheresearch.

Theresearchermaybeexpectedtoprovideshortpresentationsonthepurpose,findi ngsand

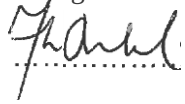
recommendationsofhis/herresearchtobothGDEofficialsandtheschoolsconcer ned.

Shouldtheresearcherhavebeeninvolvedwithresearchataschooland/oradistrict :/headoffice

level,theDirectorconcernedmustalsobesuppliedwithabriefsummaryofthepurp ose,findings and recommendations of the researchstudy.

The Gauteng Department of Education wishes you well in this important undertaking and looks forward to examining the findings of your research study.

Kind regards



.....

Ms Faith Tshabalala

CES:EducationResearchandKnowledge

Management DATE: ...

OfficeoftheDirector:EducationResearchandKnowledgeManagement

7 ' Floor, 17 Simmonds Street, Johannesburg 2001

Tel: (011) 355 0488

\Email: Faith.TshabaIala@gauteng.gov.za

Website: www.education.gpg.gov.za

APPENDIX N: ETHICS CERTIFICATE

UNISA | college of education

UNISA COLLEGE OF EDUCATION ETHICS REVIEW COMMITTEE

Ref: 2017/08/ 16/44744106/ 34/fi3C

Name: Ms A Juta

Student: 44744196

Date: 2017/08/16

Dear Ms Juta,

Decision: Ethics Approval from 2017/08/ 16 to 2022/08/16

Researcher:

Name: Ms A Juta

Email: abiejuta@yahoo.com Telephone: 012 664 5698

Supervisor:

Name: Prof C Van Wyk

Email: Vanwyk.christo1@gmaiI.com

Title of research:

The place and role of effective classroom management in the improvement of Mathematics education in Gauteng province

Qualification: D Ed in Education Management

Thank you for the application for research ethics clearance by the UNISA College of Education Ethics Review Committee for the above-mentioned research. Ethics approval is granted for the period 2017/08/16 to 2022/08/ 16.

The low risk application was reviewed by the Ethics Review Committee on 2017/08/16 in compliancewiththeUNISAPolicyonResearchEthicsandtheStandardOperatingProced

University o(SouthAfrica Preller Street. Muckleneuk Ridge.
CityofTshwanePOBox392UNISA0003SouthAfrica
'one:+27124293111FacSimile: +27124294lS0
vvvvunisa.ac.za

APPENDIX O: LANGUAGE EDITOR VERIFICATION LETTER

RUTH COETZEE
Full member: Professional Editors' Guild
Plain language practitioner
Academic specialist

34 Heritage Village
Tzaneen 0850
Cell : 072 9339417
Home : 015 0650145
Email : ruthc111@gmail.com

16 October 2018

To whom it may concern

I hereby confirm that I have completed a language edit of the dissertation by **Abigail Juta** titled: **The place and role of effective classroom management in the improvement of Mathematics education in Gauteng province.**

The work was edited to achieve

□□clarity of expression and style;
□□accuracy of grammar, spelling and punctuation;
□□consistency in all aspects of language and presentation.

The author was requested to attend to suggestions for improvement of the text, and is responsible for the quality and accuracy of the final document. References were not included in the language edit.

RCoetzee
Ruth Coetzee (Mrs)