

**AN EVALUATION OF THE IMPACT
OF THE RHODES UNIVERSITY
MASTER OF EDUCATION IN MATHEMATICS EDUCATION PROGRAMME
IN NAMIBIA FROM THE PERSPECTIVES OF ITS GRADUATES**

A thesis submitted in fulfilment of the requirements for the degree of

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ABSTRACT

Rhodes University (RU) has been offering a MEdME (Masters in Education, Mathematics Education) degree in Namibia for over 12 years without evaluating its success and impact. This study aimed to evaluate the MEdME programme's impact on the graduates and on mathematics education in Namibia from the perspectives of its graduates. The study also evaluated the factors that enabled or limited the impact of the programme from the perspective of RU staff members.

A three-phased research study was implemented to achieve this. Phase I was a MEdME theses audit to analyze what each graduate researched which then guided the sampling process. Phase II was a distribution of a questionnaire to willing MEdME graduates to elicit their views about the programme's impact. In Phase III, selected graduates were interviewed to follow up on the questionnaire. The RU academic staff members were also interviewed about the programme's design and rationale, as well as their perspectives on its impact on graduates' professional lives.

The study found that graduates believed that the programme made them more critical reflexive practitioners (CRPs) who: are now self-introspective, can reflect in context and are competent researchers. This is a sign of the programme attaining its objectives of developing and growing CRPs and graduates, who have advanced in their fields, including their ability to do research. The programme also created opportunities for graduates to study further and/or publish papers. The programme further opened up opportunities for graduates' promotion into positions of influence in the Ministry of Education where they can positively impact on mathematics education transformation in Namibia (METN). The graduates consequently noticed improvements in some areas but they also noticed room for improvement in other areas of mathematics education in Namibia.

This study therefore suggests that more mathematics teachers study further, improve their research capacity and contribute more to METN. The study also suggests a national campaign to increase mathematics teachers' content knowledge. Furthermore, the programme should reintroduce coursework to address students' subject content knowledge. RU is also advised to explore offering a Professional MEd in Namibia for students who want to focus more on improving their mathematics content knowledge. It is also proposed that Namibia establish a research bank where researchers can upload their theses for wider dissemination.

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DEDICATION

I dedicate this humble work to the memories of two people who, despite their absence,
remain close to my heart:

Meekulu Dorte Kamwenexee Haikondela, my beloved grandmother

and

Tate Hishilenga N. Shatimwene, my hero and dearest father

for instilling in me the courage to work hard and never surrender. I promised to make you
proud, and I hope that this academic achievement has at least partially delivered on that
promise.

DECLARATION OF ORIGINALITY

I, **Johannes David**, student number **17D8189**, hereby declare that this thesis entitled “An evaluation of the impact of the Rhodes University Master of Education in Mathematics Education programme in Namibia from the perspectives of its graduates” is my own work, and a product of my research. It has not been submitted in any form to another institution. Where I have drawn on ideas of people from other publications or other sources, I have fully acknowledged these in accordance with Rhodes University, Education Department reference guide.

A handwritten signature in black ink, appearing to read 'Johannes David', with a horizontal line drawn across the middle of the signature.

Johannes David

June 2021

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LIST OF ACRONYMS

ARWU	Academic Ranking of World Universities
AS	Advanced Subsidiary
BEdHons	Bachelors of Honours degree
CPD	Continuous professional development
CRP	Critical Reflexive Practitioners
CT	Career Trajectory
CTC	Career trajectory categories
DHET	Department of Higher Education and Training
DOE	Department of Education
EACB	Examination, Assessment and Certification Board
ERIC	Educational Resources Information Centre
HE	Human Ethics
HEQSF	Higher Education Qualifications Sub-Framework
HOD	Head of Department
LCA	Learner-centred Approaches
LCE	Learner-centred Education
LP	Lower Primary
MBE	Ministry of Basic Education
MCP	Mathematics Curriculum Panel
MD	Master's degree
MEd	Master of Education degree
MEdME	MEd in Mathematics Education
MEdME	University Master of Education in Mathematics Education
METN	Mathematics Education Transformation in Namibia
MHETI	Higher Education, Training and Innovation
MoE	Ministry of Education
MoEAC	Ministry of Education Arts and Culture
MPCR	Mathematics Panel for Curriculum Review
MRTEQ	Minimum Requirements for Teacher Education Qualifications

NCBE	National Curriculum for Basic Education
NCTM	National Council of Teachers of Mathematics
NDP	National Development Plan
NHREC	National Health Research Ethics Council
NIED	National Institute for Education Development
NPC	National Planning Commission
NQA	Namibian Qualification Authority
NQF	Namibian Qualification Framework
NRU	Namibian Research Units
NSFAF	Namibia Student Financial Assistance Fund
NTA	National Training Authority
PD	Professional Development
PT	Programme Theory
QoL	Quality of Life
RC	Research Capacity
RP	Reflexive Practices
RU	Rhodes University
RUESC	Rhodes University Ethical Standards Committee
SADC	Southern African Development Community
SA-NQF	South African National Qualifications Framework
SAQA	South Africa Qualification Authority
TCA	Transformation from Teacher-Centred
TDPE	Theory-driven Program Evaluation
THE	Times Higher Education
TVET	Technical and Vocational Education and Training
UNAM	University of Namibia
VET	Vocational Education and Training
VTC	Vocational Training Centre

CHAPTER 1

INTRODUCTION

1.1 INTRODUCTION

This research seeks to establish what the MEdME (Masters in Education, Mathematics Education) graduates think about the programme's accomplishments in Namibia so far. The first chapter introduces the reader to the research project by describing the context of and the motivation for the study. Second, this chapter describes the rationale and purpose of the research, the research questions and the significance of the study. Finally, it gives an overview of the structure of the dissertation.

1.2 CONTEXT OF THE STUDY

1.2.1 Introduction

Rhodes University (RU) has been offering Master of Education degrees (MEd) to Namibian students since 2007 (Euvrard, 2019; Namibia. Ministry of Education Arts and Culture [MoEAC], 2018). The normal duration to complete an MEd at RU is two years on a part-time or one year on a full-time basis. An MEd is a post-graduate qualification typically for personnel in the education sector such as teachers, academics and officials in the Ministry of Education (hereafter “selected cadres”) who wish to be equipped with “essential skills and knowledge to execute their duties effectively and professionally” (MoEAC, 2018, p. 2). Included in the RU offerings of MEd degrees is the MEd in Mathematics Education (MEdME). Like other RU MEEds offered in Namibia, the MEdME runs in two year cycles (this includes the full-time option) after which a new cohort is enrolled again (Schäfer, Samson & Brown, 2014). By 2020 there have been seven cohorts of the RU MEdME, consisting of full-time and part-time scholars, however this research focuses only on the six cohorts for the period 2007 to 2018 – see Table 1.1

Table 1.1: Summary of the number of Namibia MEdME graduates from 2007-2018.

Cohort Period		Number of students graduated			Thesis type	
		Full-time	Part-time	Total	Half	Full
1	2007-2008	0	7	7	✓	
2	2009-2010	1	4	5	✓	
3	2011-2012	1	8	9	✓	
4	2013-2014	3	5	8	✓	
5	2015-2016	0	5	5		✓
6	2017-2018	2	5	7		✓
Total		7	33	40		

1.2.2 Master of Education degree: Qualification framework

In this section I wish to discuss the basis of the MEdME programme from a legislative perspective. The main reason for this section is to look at why the programme was initiated and how it fits into the Namibian context. Table 1.2 below summarises the comparison of the Master of Education degree (MEd) in general, from both the South African and the Namibia Qualification Frameworks' perspective. The summary will be followed by a detailed discussion of the rationale for the Master's degree in general, from both the South African and the Namibia Qualification Frameworks' perspective. This is important as the Master's degree programme evaluated in this study is offered in Namibia by a South African university and I needed to understand the rationale of a Master's degree from the perspective of both countries to determine their legislative compatibility. I will then proceed to discuss the rationale and objectives of the MEdME programme in Namibia. This is to help me understand why the RU MEdME programme was introduced in Namibia. This discussion will conclude with a discussion on the gap which the RU MEdME programme is meant to address in Namibia i.e. why was/is it necessary for the RU MEdME programme to be offered in Namibia?

Table 1.2: the comparison of the MEd from the South African and the Namibia Qualification Frameworks

	HEQSF and MRTEQ		Namibia NQF
	Research based MEd	Professional MEd	MEd by thesis in Namibia
NQF level	9	9	9
Credits	180	180	A minimum of 240
Research component weight	• 120 credits on full thesis or • 60 credits on half thesis	At least 30 credits at Level 9	A minimum of 25% of the credits required for the award of the qualification

Purpose	Development of knowledge in the field of Education, including knowledge about professional practice at an advanced level.	Development of knowledge at an advanced level to prepare graduates for advanced and specialised professional employment in the educational field, and may include a form of work-integrated learning.	To prepare researchers who can contribute to the advancement of knowledge and/or prepare people for advanced and specialised employment.
Admission requirements	• A Bachelor Honours degree or a Postgraduate Diploma. • A Bachelor's degree at level 8.	• a Bachelor of Education Honours Degree or • another relevant Bachelor Honours Degree or • a Postgraduate Diploma in a cognate field of specialisation	• An Honours Degree or any equivalent qualification at level 8.
Length of study	• 1 year on full-time, or • 2 years on part-time	• 1 year on full-time, or • 2 years on part-time	• Two (2) years on full-time or • Three (3) years on part-time.
Learning outcomes	• The production and acceptance of a dissertation, or • Ability to relate knowledge to a range of contexts for professional practice and the production of a mini-dissertation	• A coursework programme requiring a high level of theoretical engagement and intellectual independence • A single research or technical project or a series of smaller projects demonstrating professional expertise in a sub- field of education.	• Production of a thesis, dissertation or substantial research paper, but in some cases, a series of papers.
Graduate attributes	Ability to:	Ability to:	Ability to:
	1. Deal with complex issues in education,	1. Deal with complex issues in education,	1. Demonstrate mastery of theoretically sophisticated <i>subject matter</i> and possess comprehensive, systematic...and specialist knowledge in an area at the forefront of that discipline or field
	2. Demonstrate self-direction and originality in analysing and solving problems,	2. Demonstrate self-direction and originality in solving problems,	2. Demonstrate self-direction and originality in tackling problems and engage in rigorous intellectual analysis, criticism and problem-solving.
	3. Make sound judgements, using available data and information,	3. Make sound judgments using available data and information,	3. Evaluate critically the findings and discussions in the literature by identify, analyse and propose responses to real world or complex issues drawing on the principles, theories and methodologies of a particular discipline 4. Carry out advanced information retrieval, analytical, and independent evaluation of quantitative and qualitative data

	4. Clearly communicate their conclusions to different audiences,	4. Clearly communicate their conclusions to different audiences	5. Research, analyse and argue from evidence, and be able to present and communicate academic or professional work to different audiences.
	5. Act autonomously in planning and implementing tasks at a professional level	5. Act autonomously in planning and implementing tasks with a professional orientation in education	6. Independent thinking
		6. Design and critically evaluate analytical writing,	
Progression	A requirement for admission to a cognate Doctoral degree	Minimum entry requirements for admission to a cognate Doctoral Degree	Part of the requirements for admission to a Doctoral Degree for mathematics education.

1.2.2.1 Master of Education degree from the Higher Education Qualifications Sub-Framework as revised, and the Minimum Requirements for Teacher Education Qualifications perspectives

According to the Higher Education Qualifications Sub-Framework (HEQSF), “the revised HEQSF, in line with the previous framework, provides the basis for integrating all higher education qualifications into the National Qualifications Framework (SA-NQF)” (Department of Education (DOE), 2013, p. 9). The HEQSF discusses the Master degree in general in South Africa, while the Minimum Requirements for Teacher Education Qualifications (MRTEQ) is more detailed as it relates specifically to the Master of Education degree (MEd). The MRTEQ states that it “aligns qualifications for teacher education” with the HEQSF (South Africa. Department of Higher Education and Training (DHET), 2015, p. 3). It therefore seems that the MRTEQ is adopted from the HEQSF where the former is a more specified version of the latter, since the former is tailor-made for the teacher education department in particular. The two documents therefore articulate well with each other. Below I will discuss the Master of Education (MEd) Degree from the MRTEQ point of view. This is because the MRTEQ pertains more directly to my study (which is evaluating the impact of the MEd in mathematics education), than the HEQSF which is more general.

a) Purposes of the programme

According to the MRTEQ there are two types of MEd in South Africa - a research based MEd and a professional MEd (DHET, 2015). Even though the emphasis in these two forms of the

MEd is research and knowledge production, the purposes of these two forms of MEd differ somewhat. The Professional MEd has the primary purpose of producing graduates who can contribute to the development of knowledge at an advanced level to prepare them for advanced and specialised professional employment in the educational field, and may include a form of work-integrated learning (DHET, 2015). This is a hands-on degree with a heavy practical component giving students the skills and knowledge needed to work professionally in their chosen field. The programme emphasises the acquisition of key teaching practices and students are expected to develop a wide range of practical teaching skills in their chosen field.

In contrast, the research based MEd aims to prepare researchers who could contribute to the development of knowledge in the field of education through research, including knowledge about professional practice, at an advanced level. A research based MEd involves learning through research, hence students are required to carry out their own research projects in a specialized field of study, for instance in mathematics education. The main difference of the research based MEd from the professional MEd would be that the former aims to equip graduates to become better researchers while the latter aims to equip graduates to become better personnel in a particular field.

b) Outcomes of the programmes and graduates' attributes

The MRTEQ indicates that the requirements for the successful completion of the two types of MEds in South Africa also differ to some extent. A research based MEd by dissertation can be obtained either by full thesis or half thesis mode. On a full thesis mode, a student is required to successfully complete a single advanced research project, culminating in the production and acceptance of a dissertation or other forms of research. The other forms of research may include a technical report, creative performance(s) or work(s), or a series of peer-reviewed articles or other research-equivalent outputs, in addition to a dissertation or treatise (DHET, 2015). On a half thesis mode, a student is required to successfully complete a coursework programme requiring a high level of theoretical engagement and intellectual independence, and in some cases demonstration of the ability to relate knowledge to a range of contexts for professional practice. In addition, this option of a research based MEd must contain a research project accounting for a minimum of 60 credits at level 9, culminating in the acceptance of a mini-dissertation or other forms of research as listed earlier (DHET, 2015).

To complete a professional MEd, a student is required to successfully complete a coursework programme requiring a high level of theoretical engagement and intellectual independence as

well as demonstration of the ability to relate knowledge to solving of complex problems in appropriate areas of professional practice. The MRTEQ further indicates that a professional MEd must include an independent study component that accounts for at least one-quarter of the credits at NQF level 9, and can take the form of a single research or technical project or a series of smaller projects demonstrating innovation or professional expertise (DHET, 2015).

The graduates' attributes for the research based MEd and those for the professional MEd also differ slightly. The graduates of the research based MEd are expected to be able to critically reflect on theory and its application. They must also be able to deal with complex issues in a systematic and creative manner, plan and critically evaluate research, make informed judgments based on the data and information at their disposal, and communicate their findings clearly to specialist and non-specialist audiences. They should also be able to show initiative and creativity in approaching and solving problems, plan and implement projects independently with a theoretical grounding, and continue to learn and improve their knowledge, understanding, and skills (DHET, 2015). Those are consistent with the expectation from the professional MEd to a greater extent. However the professional MEd is more oriented towards specific fields of education, hence the graduates are expected to act autonomously in planning and implementing tasks with a professional orientation in education, and continue to advance their knowledge, understanding and skills relevant to education.

There are a number of similarities in the graduates' attributes for the two forms of the MEd in South Africa. The graduates from both of these programmes are expected to have the ability to deal with complex issues in education both systematically and creatively, make sound judgments using data and information at their disposal and communicate their conclusions clearly to specialised and non-specialised audiences. The graduates are also expected to demonstrate self-direction and originality in solving problems, particularly by collecting and analysing relevant data. It is also expected that the graduates will continue to advance their knowledge, understanding and skills relevant to education.

It therefore seems prudent that the graduates are also expected to have the ability to act independently in planning and implementing tasks. The expected level of planning and implementation, however, varies as the research based MEd graduates are expected to plan and implement tasks at a professional level generally, while the graduates of the professional MEd are expected to plan and implement tasks with a professional orientation in education. My interpretation of the two levels of implementation is that, unlike the research based MEd

which is more general, the professional MEd graduates are more specialised, hence they are also expected to specialise in the planning and implementation of tasks specific to a particular specialisation.

The discussion above indicates to me that even though the two forms of the MEd in South Africa aim to achieve quite different purposes, the graduates' attributes of the two programmes are quite close to each other. The main difference being that the professional MEd develops specialists in teaching a particular subject for instance, while the research based MEd focuses on developing research experts in a particular field, for instance in mathematics education. This information is important in my study as I needed to understand the details and locate the MEdME programme within the legislative framework. Understanding the details of these programmes also helped me to understand how the MEdME, whose impacts are being evaluated in this study, articulates within the Namibian context, considering that Namibia as a country also has its own qualification frameworks against which programmes in Namibia should abide. In the next section I discuss how the MEdME aligns with the Namibian MEd. I did this by comparing the similarities and differences between them.

1.2.2.2 Master's degree from the Namibian Qualification Framework

The level descriptors for the Namibian Qualification Framework (NQF) indicates that the Master's degree (MD) in Namibia is also a level 9 qualification (Namibia. Ministry of Education (MoE), 2006, p. 28). The requirements for admission is a Bachelor of Honours degree (BEdHons), or any qualification at level 8. In terms of the Namibian Qualification Framework (NQF), the Master's degree MD has five objectives. In Table 1.2 above the objectives are listed and numbered under graduates' attributes and in the discussion below reference will be made to the numbering of those objectives in the table.

The first objective states that MD graduates shall have a “comprehensive, systematic...and specialist knowledge in an area at the forefront of that discipline or field”, hence demonstrate mastery of theoretically sophisticated subject matter (Namibia. MoE, 2006, p. 6). This would align with the word ‘master’ in a discipline. According to McIntosh (2013) a ‘master’ generally is an expert in something viz. a person who is very skilful in a particular job or activity. Even though this view may not represent the views of all other authors regarding what a Master is, this view is still useful for understanding what is meant by ‘master’ in Namibia, particularly in the educational policies. As such the first objective seems to align well with the first objective for the MEd in SA from the MRTEQ perspective which is for graduates to be able to deal with complex issues in education both systematically and creatively. This is because a person who

is an expert, either in education in general or in a particular field, will easily be able to deal with complex issues arising from that field.

However, the University of Namibia (UNAM) states that the MD in Mathematics Education in Namibia has a purpose of producing “experts capable of promoting advanced teaching and research” in Mathematics Education (University of Namibia (UNAM), 2019, p. 278). Hence the first objective envisions that any MD graduate in Namibia shall be an expert in the field they specialize in. This objective seems to align well with the SA professional MEd which is more interested in developing specialists in teaching subject matters.

Building on the first objective above, the second objective requires the MD graduates to “demonstrate self-direction and originality in tackling problems” and engage in rigorous intellectual analysis, criticism and problem- solving. (MoE, 2006, p. 6). My interpretation of this objective is that if the graduate has acquired expertise in a particular field, he/she should be able to work independently in that field. This independent work would include researching and contributing to the body of knowledge in the field, and also to answering key questions in the field to tackle problems in that field and beyond. The second objective of both of the SA MEds as noted in table 1.2, in accordance with the MRTEQ, is the ability to demonstrate self-direction and originality in analysing and solving problems. It therefore seems that the second objective of the Namibian MEd aligns well with both of the two SA MEds.

Since all fields of studies already have established principles, when graduates demonstrate their expertise, they should at least be in alignment with the existing principles. The third objective thus requires the graduates to be able to evaluate critically the findings and discussions in the literature by identifying, analysing and proposing “responses to real world or complex issues drawing on the principles, theories and methodologies of a particular discipline” (MoE, 2006, p. 6). This third objective seems to be consistent with the third objective of both of the SA MEd as highlighted in Table 1.2 which is for graduates to have the ability to make sound judgments using available data and information.

The fourth objective requires the “ability for advanced information retrieval, analytical, and independent evaluation of quantitative and qualitative data” (MoE, 2006, p. 6). This suggests that graduates should not only be producers of new knowledge but also be critical consumers and evaluators of research. This objective also seem to align well with the third objective of the two SA MEds as listed in Table 1.2.

The fifth objective requires the ability to research, analyse and argue from evidence and also “present and communicate academic or professional work effectively, catering for a wide range of specialist and non-specialist audiences” (MoE, 2006, p. 6). This objective aligns well with the fourth objectives of the two SA MEds which is the graduates’ ability to communicate their conclusions clearly to specialised and non-specialised audiences.

These five objectives can well be summarised to mean that graduates should have the ability to carry out research in order to understand and possibly solve complex problems within their fields of expertise. As such, and also from the discussion above, it can be argued that the MEdME, which is a SA MEd, aligns well with the Namibian MEd, and therefore it is compatible in the Namibian context. This is relevant to my study because I need to understand if the MEdME programme is relevant in the Namibian context from the legislative standpoint.

From the general objectives, institutions aspiring to offer a MD in South Africa or Namibia are required to draft objectives of the courses they intend offering, in alignment with the stated general objectives of the MDs above (Walters, 2011). This is to enable the course to be accredited by the Council on Higher Education and registered on the SA-NQF by the South Africa Qualification Authority (SAQA) and the Namibian Qualification Authority (NQA), the accrediting bodies in the respective countries. Accordingly, Schäfer et al. (2014) articulate the objectives of the RU MEdME programme as discussed below.

1.2.2.3 The RU MEdME framework

The overarching theme of the RU MEdME programme in Namibia is ‘reflexivity’, viz. to “develop and grow critically reflexive practitioners who will actively contribute, and have the capacity, to act as agents of change in the transformation process of Mathematics Education in Namibia” (Schäfer et al., 2014, p. 42). The Cambridge Advanced Learner’s Dictionary describes eight different meanings of the word ‘critical’. However, in my assessment the one which resonates well with the concept of reflexivity is “to act carefully about a subject or idea” (McIntosh, 2013). This definition is in conformity with the meaning of the word ‘critical’ described in other literature. According to Cunliffe (2004) and Holmes, Cockburn-Wooten, Motion, Zorn, and Roper (2005, p. 249), the word critical in the concept critical reflexive practitioner “suggest both the sense of questioning, as in ‘critical thinking’, as well as unmasking hidden meanings with a goal of emancipating thinking and action” (p. 249). Reflexivity on the other hand can be traced in literature to be closely related with the word

reflection. Below I discuss the difference between reflexivity and reflection as I describe the meaning of them both and how they are relevant to my study.

Literature indicates that the words reflection and reflexivity are closely related. Reflection as described by Dewey (1933) is an “active, persistent, and careful consideration of any belief or supposed form of knowledge in light of the grounds that support it and the further consequences to which it leads’ (p. 9). Another prominent writer who has contributed significantly to the concept of reflection is Schön (1983) who made a distinction between two categories of reflection namely reflection-in-action and reflection-on-action. Reflection-in-action “takes place during an action, and reflection-on-action takes place after an event has occurred” (Schön, 1983, p. 50).

Schön’s concept of reflection ‘in action’ however did not go without criticism. Eraut (1995) was one of the greatest critiques of the concept reflection ‘in action’, citing that Schön “neither analyses everyday practice nor attempts to consider how reflective processes might serve different purposes or vary from one context to another. Most of his examples fail to provide evidence of reflection-in-action and none of them relate to crowded settings like classrooms” (p. 9). In response to what Eraut called Schön’s flaw and in his contribution to the literature on reflection, Eraut (1995) rather wrote:

“The preposition *on* should refer to the focus of reflection while the preposition *in* refers to the context of reflection. The alternatives to reflection-in-action are reflection before action, reflection after action and reflection away from or out of the action. Reflection-in-action and reflection-on-action are not dichotomous opposites, indeed reflection-in-action is usually (though not always) on the action as well... It is also useful to introduce a third preposition, *for*, not used by Schön ... to indicate the purpose of any reflection...” (p. 16)

By redefining the prepositions (on and in) used by Schön and by introducing the preposition *for*, Eraut (1995) explains that the emphasis of reflection should not only be on the context and the focus of reflection but also on the purpose of reflection. Reflection *for* action therefore means “thinking about future actions with the intention of improving or changing a practice” (Eraut, 1995, p. 16). This however resonates well with Schön concept of reflection-in-action in that, reflection-in-action is done whilst the event is happening (i.e. thinking about what you just did while you continue doing the task) and the result of such a thinking can be used formatively to improve or change practice (Schön, 1983).

I therefore agree with Stîngu (2012) who clarified that, reflection ‘on action’ is what many authors today refers to as reflection where an individual would examine his or her experiences of an event; whereas reflection ‘in action’ and ‘for action’ is what is nowadays referred to as reflexion/reflexivity. According to Bourdieu and Wacquant (1992) reflexivity is a Latin derived word which means “to turn back on oneself” (p. 36). Turning back on oneself here means that an individual reflects on how their own beliefs, assumptions and perceptions, might have contributed to a situation at hand and also how it may affect future events.

The discussion above is important to my study as I need to understand the meaning of the concept reflexion/reflexivity which as stated earlier is the main objective of the MEDME programme. It is clear from the above discussion that reflexivity is the type of personal reflection which is done ‘in and for’ action. I also argue that in the process of reflexion, the contribution of other people are important. My argument in this regard is based on von Foerster (1991) who stated that reflexion means reflection “through the eyes of the others” (p. 69). Similar sentiments are echoed by Glanville (2013) who defined reflexivity as “the reflection on one’s ideas now embracing the reflection of others’ reactions to form a wider system” (p, 65). My argument is that, if we consider the contributions of the authors above (Bourdieu & Wacquant, 1992; Eraut, 1995; von Foerster, 1991; Glanville, 2013; Schön, 1983), reflexivity is when an individual reflects on themselves with the purpose of improving or changing practices (for action). In the process of reflecting the individual would consider not only how their own perceptions, might have contributed to a situation at hand but also the perspectives of the others/community (context).

Reflexivity and reflexive practice have been used interchangeably and defined by many other authors. Cunliffe (2004, p. 407) for example, defines reflexive practice as encompassing “subjective understandings of reality as a basis for thinking more critically about the impact of our assumptions, values, and actions on others”. Cunliffe (2016, p. 741) defines reflexivity as an act of “questioning what we, and others, might be taking for granted—what is being said and not said—and examining the impact this has or might have.” According to Gergen (1999, p. 51), reflexivity is “the attempt to place one’s premises into question, to suspend the obvious, to listen to alternative framings of reality, and to grapple with the comparative outcomes of multiple standpoints”. This suggests that nothing should be taken for granted or be believed without questioning. If everyone thinks something is true, it still requires scrutiny and questioning. Before believing in something, then one needs to consider alternative standpoints and make comparisons using others’ views to help in deciding what to believe. In reflecting on

our standpoints and assumptions therefore, we must be open to other possibilities and be willing to embrace a different standpoint if deemed necessary.

Reflexivity can be divided into two levels: self-reflexivity and critical reflexivity. Cunliffe (2016) refers to these as the two levels at which reflexivity works. To Cunliffe (2016, p. 741) being self-reflexive requires us to reflect on “our own beliefs, values, and so on, and the nature of our relationships with others, what we say, and how we treat them”, whereas being critically reflexive is about reflecting on “organizational practices, policies, social structures, and knowledge bases”. Both self- and critical reflexivity are important, however the overarching objective which has led to this discussion and my study at large is only focused on critical reflexivity; therefore my focus will be more on critical reflexivity. An individual who practices critical reflexivity is called a “critical reflexive practitioner” (CRP) (Cunliffe, 2004).

From the discussion above, a critical reflexive practitioner is an individual who, for example, reflects deeply on the operation of an organisation of which they are part of. In other words, a CRP is a person who is able to examine themselves and their assumptions in relation to the organisation in which they operate. This individual should be willing to entertain the possibility that there exists a multitude of different ways, views or experiences in the “organizational practices, policies, social structures, and knowledge bases” of the individual institution (Wright, 2012, p. 3). This person should then be open to fresh possibilities and ideas, and should also be honest enough to recognize that his/her “assumptions and preconceptions about reality could be limiting” (Wright, 2012, p. 3). Such uncertainties about knowledge and reality could trigger interesting curiosities to find out and research the truth. This may suggest that a CRP should also be a researcher. This resonates well with the emphasis of Schäfer et al. (2014, p. 40) that a reflexive graduate should demonstrate “a broader and critical perspective on Mathematics Education” and should be able to carry out research.

Through reflexivity, educators can “examine critically the assumptions underlying their actions, the impact of those actions, and from a broader perspective, what passes as good... practice” (Cunliffe, 2004, p. 407). Successful graduates should therefore be reflexive by integrating their learning and personal experiences with their practice. This includes researching on issues about mathematics education in the Namibian context (Schäfer et al., 2014), and using the findings to challenge both the existing and emerging theories and knowledge in mathematics and mathematics education in Namibia. Through that, the graduates would have the capacity to act as agents of change in the transformation process of

Mathematics Education in Namibia. My study aims to establish the extent to which these objectives have been, or are being achieved, and what, if any, mitigates against them being achieved. The discussion above is also important in understanding what the MEdME programme aims to achieve in Namibia. The concept analysis of critical, reflective and reflexive above however leaves a key question of how the conceptualisers of the MEdME view these concepts, which is discussed in Chapter 7 of this study.

1.2.3 What gap is RU addressing in Namibia?

Before the year 2006 there was no MEd offered in mathematics education Namibia. RU was therefore invited to offer a Post Graduate degree in mathematics in Namibia which they started offering in 2006 (MoEAC, 2018). The records on the University of Namibia (UNAM) research repository suggest that the University started offering the MEd in mathematics education in Namibia in 2008 (University of Namibia (UNAM), 2020). In terms of the agreement entered into by the MoE and RU in October 2006 however, several studies have found that there was still a shortage of skilled, experienced and trained human resources in all sectors of employment in Namibia, including the education sector (MoEAC, 2018). It was because of this gap in knowledge, that an agreement was signed between the then Namibian Ministry of Education and Rhodes University (MoEAC, 2018) for RU to continue offering the degree in spite of it being offered by UNAM.

According to the MoEAC (2018, p. 3), by offering the BEdHons, MEd, and PhD degree programmes, RU pledged to “work in consultation and collaboration with other interested agencies” to achieve the following three objectives: (1) provide professional development in consonance with the MoEAC’s human resources development strategy, capacity building and strategic plan; (2) equip students with the necessary and appropriate knowledge and skills to execute their duties and responsibilities effectively, and (3) provide training opportunities for those who anticipate to pursue lifelong learning. This study focuses on whether, and if so, to what extent the MEdME graduates are equipped with the knowledge and skills; and evaluate the impact the MEdME has had on these graduates’ reflexive practices (RP), career trajectory (CT), research capacity (RC), and perspectives towards mathematics education transformation in Namibia (METN).

This chapter explains how the MEdME was started in response to a gap in knowledge and post graduate educator professional development in the field of Mathematics Education in Namibia. The extent to which, if any, from the graduates’ perspective, the MEdME achieved the

aforementioned objectives, and the impact it has had on its graduates and more broadly on mathematics education in Namibia, is the focus of this study.

1.3 RATIONALE FOR, PURPOSE AND SIGNIFICANCE OF THE STUDY

The graduates of the RU MEdME in Namibia of the past 12 years can be found in different positions and ministerial departments in Namibia and possibly elsewhere in the world. The question is whether, and if so, to what extent, the graduates of this programme are demonstrating critical reflexivity in their professional work spaces as they strive towards being transformative change agents in mathematics education in Namibian and further afield. The extent to which the acquisition of the MEdME has had an influence and the subfields in which it has had such, and the evidence which supports this, forms the central core around which this thesis is built.

The purpose of this evaluative study, therefore, will be firstly to evaluate the MEdME against its stated objectives, and secondly, to evaluate the impact of the MEdME on the graduates and on mathematics education in Namibia from the perspective of the graduates themselves. The study further aimed to evaluate the factors which enabled or constrained the impact of the MEdME from the perspectives of the RU staff members who have been core to this programme since its inception. The findings of this study shed light on the type of programme that may enable and support change in a specific discipline (mathematics education) in a specific context (the developing world of Namibia) which may be relevant to similar contexts. Furthermore, it will shed light on how the MEdME programme may be strengthened and enhanced. The stated outcomes against which the MEdME will specifically be evaluated are:

1. developing and growing critically reflexive practitioners;
2. graduates that have grown in their own professions including their capacity to research; and
3. graduates that have the capacity to act as agents of change in the transformation process of mathematics education in Namibia.

1.4 RESEARCH QUESTIONS

My study will be framed by one main research question and three sub-questions. The main research question is:

How has the RU MEdME programme impacted on its graduates in the context of the mathematics education terrain in Namibia from the graduate's perspectives?

In order to answer this question, the following sub-questions are posed:

1. How has the MEdME programme shaped the graduates' critical reflexive practices in mathematics education in Namibia?
2. How has the MEdME programme impacted on the graduates' career trajectory and research capacity?
3. How (if at all) do the graduates perceive their participation in the MEdME programme to have contributed to mathematics education transformation in Namibia?
4. What has enabled or constrained the perceived impact of the MEdME from the lecturers' perspective?

1.5 OUTLINE OF THE RESEARCH REPORT

Chapter 2 of this study presents the conceptual and the theoretical frameworks and a review of the literature that informed and shaped the analysis and interpretations of the data in this study. Key concepts associated with evaluation, including for example, formal and informal, formative and summative evaluations, programme evaluation and theory are discussed.

Chapter 3 describes and justifies the research methodology and methods used to collect the data. The three-phase research design is explained as is the sampling techniques that were used to identify and select the participants. This chapter further discusses the modalities on the subject of data analysis, validity, ethical considerations and challenges I encountered during data collection.

Chapter 4 presents the analysis and discussion of the findings of the data gathered through the survey that was done as in Phase II. This phase followed Phase I which entailed the thesis audit done for sampling purposes.

Chapter 5 presents the analysis, findings and discussions of the data obtained through interview with the graduates in Phase III of the research.

Chapter 6 presents the analysis, findings and discussions of the data obtained through interviews with the RU academic staff members who have been core to the MEdME programme since its inception. The findings are discussed in relation to the literature on programme theory which was reviewed in Chapter Two. These findings provide an understanding of the design and rationale of the programme.

Chapter 7 synthesises the findings, makes recommendation and concludes the study.

CHAPTER 2

LITERATURE REVIEW AND THEORETICAL PERSPECTIVES

2.1 INTRODUCTION

This chapter discusses the literature relating to programme evaluation. Programme evaluation as a research field manifests itself in different types. This chapter will therefore firstly discuss the classification of programme evaluation as a research field in order to set demarcations and clearly state what type of programme evaluation this study undertook. Secondly, this chapter presents and discusses the concept of programme theory by describing what it is, the benefit of developing it, approaches to developing it and the elements which must be part of a complete programme theory.

2.2 CONCEPTUAL FRAMEWORK

2.2.1 Programme evaluation

In this section, I will discuss some features of programme evaluation. This will include defining programme evaluation further and discussing the different types, and how they differ from each other. The main reason for this discussion is to set demarcations and clearly state what type of programme evaluation this study undertook.

2.2.2 What is programme evaluation?

Communities are continuously in need of services which make life more meaningful, convenient and manageable for its people (Alkin, 2013). These services, such as education, are normally provided by institutions (i.e. schools and other educational institutions) which are put in place to serve these communities. These institutions typically systematize the services into programmes. A programme can therefore be defined as “an organized collection of activities designed to reach certain objectives” (David, Bruce & Deborah, 2010, p. 5). By organized activities is meant that “programmes are not a random set of actions but a series of planned actions designed to solve some problem”, therefore, “if there is no problem, then there is no need for programmatic intervention” (David et al., 2010, p. 5). The MEdME programme, for instance, was implemented as a response to an identified problem in Namibia, as highlighted in 1.2.3 above, and resulted in the initiation of a series of planned actions to serve that particular purpose. According to David et al., (2010) a programme is an intervention or service that is initiated by an established institution and is, therefore, expected to have an impact on the programme participants and possibly, the society at large. The institution providing a

programme should be interested in knowing whether the services provided really fulfil their promise, that is, the objectives it was initiated for and if so, to what extent? Other questions that arise are what, if any, impact has the programme had on different aspects of the society? Are there any other outcomes or impacts of the programme which have resulted which were not initially targeted for by the programme? As stated earlier, answering these questions would require a programme evaluation.

According to Barker (2003), programme evaluation can also be referred to as evaluation research. For this reason, in my study I will use the term programme evaluation and evaluation research interchangeably. Programme evaluation can be defined as a systematic investigation to determine the success of a programme, i.e. determining the effect the programme has had on recipients by comparing the programme's outcomes with its initial objectives (Fitzpatrick, Sanders & Worthen, 2011), believing that the outcomes are mainly as a result of the programme. In the absence of programme evaluation, the programme implementers and all the stakeholders may not be able to know the extent to which the programme accomplished its objectives. In the process of programme evaluation the evaluator should determine the objectives of the programme "in measurable ways" to enable "the assessment of whether the objectives were reached" (McNeil, Newman and Steinhauer, 2005, p. 13). Programme evaluation, to some extent, seeks to show that changes in the programme targets are due mainly to their inherent place in the programme.

Lately, programme evaluation as a research field has grown and is gaining significance in the academic world. According to Stufflebeam and Coryn (2014, p. 3) evaluation "is perhaps society's most fundamental discipline; it is an essential characteristic of the human condition; and it is the single most important and sophisticated cognitive process in the repertoire of human reasoning and logic". Programme evaluation is therefore a critical and essential element in all the organisations responsible for programme implementation of some sort. This is because participants in these programmes are inherently at risk of receiving poor quality products and services. Stufflebeam and Coryn are of the view that evaluation research can play an important role which they assert can "rescue [sic] the society by providing affirmations of worth, value, progress and, when necessary, a reliable reason for terminating bad programmes or, expanding good ones" (2014, p. 3).

Fitzpatrick et al., (2011) suggest that all programmes naturally undergo some form of programme evaluation. If a particular institution, for example, starts offering a course,

members of the larger society would naturally be closely looking at the quality of the graduates to see what happens to them after graduating. Fitzpatrick et al., (2011) contends that society will be looking at the graduates to see if they will be better people in terms of the knowledge gained: Would they be more in demand for employment opportunities? Will they secure a better job or a promotion, or will they still remain what they were with no observable improvement in and around them? Evaluation is, therefore, not a new word/concept. In fact, “people have been evaluating, or examining and judging things, since the beginning of human history” (Fitzpatrick et al., 2011, p. 5).

Fitzpatrick et al. (2011), made an observation that “practitioners (e.g. teachers), managers, and policymakers make judgments about learners, clients, personnel, programmes, and policies all the time” (p. 5). A school principal, for instance, may observe a teacher’s teaching practices in the classroom and that observation could lead to some judgments about the effectiveness of that teacher’s teaching. Such judgments may lead or influence important and far-reaching decision-making. It can thus be argued that every decision is, basically, preceded by some kind of evaluation, however shallow, and since making decisions is part of human nature, evaluation can also be considered to be innate to human being and perhaps even other animals. Therefore, as individual members of society observe a programme in operation, they all make their individual evaluation of that program. However, even though such evaluations are made every day in our society, many of these are done informally and spontaneously, whereas others are meticulously planned and done formally. This distinction marks the demarcation between the two main categories of programme evaluation: informal and formal programme evaluation (Stufflebeam & Coryn, 2014).

Informal evaluations are likely to be informed and influenced by our experiences, instincts, generalizations and reasoning, and for these reasons, they can produce faulty and unreliable results. They are characterized by an absence of in-depth scrutiny because they lack systematic procedures and formally collected evidence (David et al., 2010). Informal evaluations are also a more subjective form of evaluation because they can be influenced by personal opinions without necessarily the support of formally collected data.

In contrast, *formal evaluations* are more objective as they allow an evaluator to bring “multiple perspectives and data sources to an evaluation and lead to more informed decisions and deeper understandings” (David et al., 2010, p. 52). My study is a formal programme evaluation as it is conducted in a systematic way and seeks empirical evidence to draw conclusions and

possibly recommendations based on the findings. Formal evaluation can be conducted for two different reasons and as such, they are classified into two types, namely formative and summative evaluation.

2.2.3 Formative vs Summative programme evaluation

The main differences between formative and summative programme evaluation is in the use of the evaluation results. The difference between formative and summative programme evaluation are discussed in this section and some types of each are also briefly discussed.

2.2.3.1 Formative programme evaluation

According to Baird (1990, p. 17) the central drive of formative evaluations is to “gather information that can be used to improve or strengthen the programme or the implementation of a programme”. Formative evaluations are therefore ongoing during programme implementation, and the findings of a formative evaluation study may be used to make modifications in the programme, improve on implementation processes or to re-allocate resources (David et al., 2010). This would suggest that amongst the stakeholders, the main audience for the findings of the formative evaluation study are the programme managers and implementers as they are the ones who are core figures in the implementation process of the programme (David et al., 2010).

One of the main questions an organisation should consider is, who should carry out the evaluation of their program as this can be a bone of contention and lead to criticism of the evaluation findings (Fitzpatrick et al., 2011). David et al., (2010) advises that it is preferable that formative evaluation be carried out by an internal evaluator. By internal evaluator it is implied that a formative programme evaluator should be an individual who can tell the story of the programme implementation and its challenges from experience, so that more realistic challenges (regarding the implementation of the programme) can be addressed (Linfield & Posavac, 2019). Even when the evaluation is to be done by an external evaluator, for it to yield valid and realistic results, an internal evaluator should be appointed to collaborate with the external evaluator (Linfield & Posavac, 2019).

Since most formative evaluation are qualitative studies, it is preferred that the sample of a study is small to ensure “gathering of in-depth understanding of a phenomenon which is often centred on the *how* and *why* of a particular issue, process, or set of social interactions” (Linfield & Posavac, 2019, p. 41). In support of these assertions, Baird (1990) states that the questions formative evaluation seek to address are mostly aimed at finding out what is working, why,

what needs to be improved, and also how it can be improved. According to Fitzpatrick et. al. (2011) formative evaluations are classified into two main types: the needs assessment and the process evaluation, which are discussed below.

a) The needs assessment as a programme evaluation

When a programme is initiated, there are a number of question one may ask, like: which target populations require the service the programme ought to provide, what types of services the programmes should provide, how much of that service would be required or which kinds of services will be most effective. To find answers to such questions, a needs assessments can be the best way as it determines the needs of individuals and/or communities (Altschuld & Watkins, 2014).

A needs assessment is thus defined as a systematic process which aims to determine the needs which a particular population or community has and how the initiated programme can address such needs (Altschuld & Watkins, 2014). A need is defined by Altschuld and Watkins (2014, p. 6), as “a measurable gap between two conditions: what currently is, and what it should be.” When doing needs assessment one should “establish what the situations are at a point in time, what is desired in the future, and a comparison of the two” (Altschuld & Watkins, 2014, p. 6). It is therefore sensible to argue that needs assessments do not only focus on the status quo and the desired destination, but they should also gather data and make recommendations about how to narrow the gap between the contemporary state of affairs and the anticipated outcomes.

By gathering data from different sources, needs assessments are able to accurately determine the challenges and needs of the community as well as the possible solutions to these needs and challenges. The evaluator can also, in the process, discover some positive aspects in the community and in individuals and therefore the evaluator may capitalise on those strengths as he/she tries to establish the best possible solutions. According to Altschuld and Watkins (2014), conducting an effective needs assessment requires one not only to focus on deficits in individuals and communities, but also to “explore existing strengths, capacities, and assets” (p. 6). This is because if evaluators narrow their focus too much on the question of what is missing, they are taking the risk of being blinded to the existing assets on which a programme can hinge, to magnify success opportunities. Effective needs assessments therefore should “ask questions about: continuing needs, current strengths/assets/capacities, and also the desired states” (Altschuld & Watkins, 2014, p. 6). It is therefore evident here that needs assessments can help programmes to effectively deliver suitable services to the appropriate populations.

b) Process evaluation as programme evaluation

Some formative evaluations are classified as process evaluations which can equally be called implementation evaluation or monitoring studies (Wasserheit, 2001). These are the kinds of studies which aim to determine whether programme activities have been implemented as intended. As a programme develops, it is naturally necessary for the programme implementers and other stakeholders to assess how well the implementation process is progressing, and if possible, to make improvements. This is called a process evaluation because the evaluation is focused on how the process of implementation is proceeding. Process evaluations include recording actual programme functioning (Dehar, Casswell & Duignan, 1993) and identifying barriers to implementation (Demers & Renaud, 1992).

In process evaluation the evaluator identifies the target population, describes the “services delivered, the use of resources, and the qualifications and experiences of the personnel participating in the implementation process” (Wasserheit, 2001, p. 7). In short, process evaluation involves determining what services are being delivered, to whom, and what resources are available for use in the process of implementing the programme. The main reason for an evaluation of the process is to see if there is room for improvement for better implementation of the programme. This is what makes process evaluation a type of formative evaluation, because the results are meant for formative purposes i.e. to help in improving the implementation of the programme.

2.2.3.2 Summative programme evaluation

The main intention of summative evaluations is to show whether or not the programme under scrutiny has achieved the outcome for which it was initiated (i.e. intended effects at individual, organizational, and/or at community level) and “to indicate the ultimate value, merit and worth of the programme” (Baird, 1990; Kellaghan et al., 2003, p. 710). The findings of a summative evaluation can therefore be used to decide on the future of the programme i.e. whether the programme should be continued or not.

According to Fitzpatrick (2011) a summative evaluation has three main intentions: (1) to determine whether the programme’s objectives are being achieved or not; (2) to determine the extent to which the programme objectives are being achieved; and (3) to establish what achieving (or not achieving) the intended outcomes has led to. This indicates a distinction between two main types of summative evaluation: the outcome evaluation and the impact evaluation. Below, I discuss what each of the two types of summative evaluation entails.

a) Outcomes evaluation as programme evaluation

Outcomes are predictable and often measurable effects, the extent of which can be pre-defined and the scope of which is normally limited, since they are based on the programme's objectives which are pre-defined and fixed (Rossi, Lipsey, & Henry, 2018). Outcomes can also be considered as having obtained short-term and intermediate achievements which are attained by the programme participants as a direct result of the programme they participated in (Wholey et al., 2010). The success of a programme is determined by the degree to which the objectives of a programme were met. This means programme outcomes evaluation is an evaluation with a focus on finding out as to what extent a programme has met its objectives. When reporting the findings, the evaluator should inform the audiences of how much was achieved for each objective. Because of this tendency, it is often appropriate to use quantitative methods to assess and report on the findings of an outcome evaluation (Frye & Hemmer, 2012).

In this study for instance, one of the foci is to evaluate and interrogate the outcomes of the MEdME in Namibia. The evaluator therefore firstly has to determine the objectives that the programme aims to achieve. Subsequently, the evaluator uses appropriate strategies to establish which objectives were achieved and analyse to what extent the objectives were achieved, or not. The disparity between what was anticipated for and what is achieved, will represent and be reported as the final outcomes of the MEdME in Namibia.

According to Rossi, Lipsey, & Freeman, (1999), outcome evaluations can be conducted at different points during a programme's lifespan: normally, after an interim implementation cycle has been completed, or after the entire programme is completed. My study, for instance, is being conducted after the programme which has been running for 12 years, and is still continuing. Nevertheless, the aims of the outcome evaluation remain the same, regardless of when the evaluation is conducted, which is to determine the outcomes achieved through programme activities and whether the desired effects of the programme were obtained.

b) Impact evaluation as programme evaluation

Impact evaluation determines the ultimate and the side effects of the program, i.e. the consequence of the outcomes of a program (Frye & Hemmer, 2012). As discussed earlier, outcomes measure the extent to which an objective was achieved; conversely, impact evaluation determines what the achievement of objectives leads to (Rossi et al., 1999). In my study this would mean that in order to determine the impact of an educational program, I should first determine the outcomes of the program, then further assess what these outcomes lead to,

in terms of individual participants, fields of study and/or the education system at large. This can well be done through a theory driven programme evaluation framework (to be discussed later in this chapter), as suggested for my study. Either way, the anticipation is normally for positive impact to have occurred – in the case of my study, in the *professional lives* of the graduates and in mathematics education *transformation* in Namibia (METN).

Graduates' *professional life* here refers to “a career in ... professional activities” such as teaching (Barker, 2003). According to Herr, Cramer and Niles (2004, p. 44), the term ‘career’ is normally used to “describe a series of positions (*trajectory*) available in some occupations ... connoting possibilities for advancement”. In my study, the words ‘career trajectory’ will be used to denote the way graduates’ professional lives have developed.

The discussion above reveals that the impacts of a programme can be broader than the outcomes and the impacts might be harder to measure since they may or may not happen (Fitzpatrick et al., 2011). Impact is also harder to measure because an impact is normally a long-term effect of an outcome and much harder to pre-define. Unlike outcome evaluation, impact evaluation appears to be more complex and non-linear, and warrants a qualitative approach (Mostert, 1996). When compared to outcomes which can be pre-defined and can also be measured objectively, the individual experiences and innately special “nature of impact evaluation is intuitively subjective” (Mostert, 1996, p. 191). Being objective means that you are basing your evaluation on concrete/factual evidence, while subjective means that evaluation is focused or can be based on or influenced by personal feelings, opinions or emotions (Barker, 2003). Having a subjective nature then, impact evaluation is concerned with the effect of the outcome of the programme at an individuals’ personal level. For example, what influence do the programme’s outcomes have on individual participant’s critical reflexivity, professional trajectory, research capacity etc.? This is why a programme’s impact is often rather unpredictable. In a nutshell, “impact is what we hope for, but outcomes are what we work for” (M&E Blog, 2013).

2.2.4 What type of programme evaluation is my study?

The discussion above provided a broad snapshot of what kind of programme evaluation my study represents. The purpose of my study, as stated earlier was to evaluate the MEDME programme against its stated objectives, and to assess the impact of the MEDME programme on the graduates and on mathematics education in Namibia from the perspective of the graduates themselves. This means the study had two main focuses: (1) to evaluate the outcome

and (2) to assess the impact of the MEdME programme from the perspective of the graduates. My study therefore is a combination of an outcome evaluation and an impact evaluation. With regard to the impact however, my study will only focus on the impact of the MEdME programme on the graduates' reflexive practices (RP), career trajectory (CT), research capacity (RC) and perspectives towards mathematics education transformation in Namibia (METN) from the perspective of the graduates.

2.2.5 Philosophical roots of programme evaluation

According to Calidoni-Lundberg (2006), a methodological approach to programme evaluation study is usually underpinned by either a positivist or realist philosophical tradition.

In positivism, the main aim of doing programme evaluation is to discover regularities and 'laws', by applying natural sciences experimental methods which 'work', viz. that can provide quantifiable evidence on the relationships between the inputs and outcomes of a program (Calidoni-Lundberg, 2006, p. 12). Positivism seems to assume that the outcomes of any programme are as a direct result of the inputs; it does not recognise the complexity and nuances of interactions between the inputs and other factors.

Positivism also does not consider theory as an important part of programme evaluation. The evaluation manuals by Morris, Fitz-Gibbon and Henerson, (1978) who were associated with the ideology of positivism in programme evaluation, outline how to carry out a programme evaluation but do not mention anything about identifying or using a theory underlying the programmes in question.

Positivism therefore has had many critics (Bickman & Peterson, 2005; Chen & Rossi, 1983; Donaldson, 2001; Leeuw, 2003; Lipsey, 1993; Pawson & Tilley, 2004; Rogers, 2008; Weiss, 2000; Wholey, 1987). The criticisms of Chen and Rossi (1983), for instance, stem from thinking about an experimental evaluation which 'works', as encouraged by Calidoni-Lundberg (2006, p. 12). In their own words Chen and Rossi state that:

a very seductive and attractive feature of controlled experiments is that it is not necessary to understand how a social program 'works' in order to estimate its net effects through randomized experiments provided that the goals and objectives of a program can be specified in reasonably measurable terms. (Chen and Rossi, 1983, p. 284)

Literally, suppose the findings of a programme evaluation study indicate that the experimental group has performed better than the control group, "by experimental logic one can claim that the program was a success" (Chen and Rossi, 1983, p. 284). While this can be true, Chen and

Rossi (1983) argue that, we actually learn nothing about why the programme worked. This may then suggest that this success cannot be guaranteed with similar programmes since what led to such success is not clearly established, if at all. Such a limitation is called a ‘black box’ problem (Pawson & Tilley, 2004). According to Astbury and Leeuw (2010), a black box problem refers to “the practice of viewing social programmes primarily in terms of effects, with little attention paid to how those effects are produced” (p. 364). With loads of criticisms levelled against the black box evaluation, an alternative approach to programme evaluation was necessary.

In response to the black box evaluation problem, Suchman (1968), asserted the importance of opening up the black box, or as he put it, “doing a ‘white box’ or ‘theory-driven’ evaluation” which aligns with a realism philosophy in evaluation (p. 364). Wholey (1987), Chen (1990) and Weiss (2000), among others, have also contributed to explaining the importance of investigating the theory underlying social programmes. These theory-driven evaluators believe that any programme represents theory in at least two ways (Tilley, 2004). First is that the introduction of a programme will lead to desired outcomes; and the second is an assumption about how a programme will bring about the desired outcome.

My study intends to go into the nuances of the MEdME programme. This intention is evident in my research questions which all start with the word ‘how’ –implying that the study is not only targeting to determine the outcomes and impact but also addressing the question of how the programme unfolded and achieved its outcomes. I will therefore categorize my study as a theory-driven programme evaluation.

2.2.6 Theory-Driven programme Evaluation

In my study, as highlighted earlier, I did not only anticipate learning about the effects of the MEdME programme, but also how and why such results developed, from the perspectives of the graduates. I therefore carried out a theory-driven programme evaluation (TDPE). TDPE is an approach to programme evaluation where evaluation is based on a particular theory called programme theory (Chen & Rossi, 1983). Donaldson (2001) describes TDPE as involving three general steps which were my guiding strategy in my evaluation. The steps include: (1) constructing a programme theory (PT); (2) formulating evaluation questions; and (3) answering evaluation questions. Through these steps, theory-driven programme evaluators claim that they can obtain answers to their research questions. However, the order of these steps can change from one study to another. For example, while some studies construct a programme theory and use it to evaluate a programme and answer the research questions; other studies are an attempt

to complete a programme theory of a particular programme (Donaldson, 2001). My study, as a TDPE, aimed to align with the programme theory of the MEdME programme in Namibia. In the next section I describe what a programme theory is, and how to construct it.

2.3 THEORETICAL FRAMEWORK

This study is a Theory-Driven Program Evaluation (TDPE) study which aimed to align with the programme theory of the MEdME programme in Namibia.

2.3.1 What is a Programme Theory?

Programme theory is also referred to as programme logic (Leeuw, 2003), a logic model (Wholey et al., 2010), a theory of change (Funnell & Rogers, 2011), programme philosophy (Conrad & Miller, 1987) or impact pathway (Douthwaite et al., 2003). However, in my study, I will use the term programme theory (PT) for consistency purposes.

Programme theory (PT), which is a fundamental requirement of TDPE, focuses on an understanding of the effects expected of a programme. Bickman (1987, p. 50), one of the icons in the programme evaluation field, offered a very informative definition of a programme theory. He defined PT as “a plausible and practical model of how the program will work in a particular context to solve identified problems”. According to Bickman (1987), these models are developed for specific programmes and “do not represent ‘off-the-shelf’ use of a single established social science theory” (p. 5). This means a programme theory of one programme may not necessarily represent the PT of all other similar programmes.

Many other authors have offered definitions and descriptions of PT. Sidani and Sechrest (1999, p. 228) explained that PT is not just a list or table of items but rather a “set of statements describing/explaining why, how, and under what conditions the program effects occur, predicting the outcomes, and specifying what needs to be done to bring about the desired program effects”. To Lipsey (1993), PT represents the explanation of how a programme is supposed to achieve what it was initiated for as it (PT) “...explains what goes on inside the ‘black box’ during the transformation of input into output” (p. 7). Chen (2005) defines a PT as an implicit assumption, about how the implementation of a programme's activities is supposed to achieve the intended outcomes. Another interesting definition is by Conrad and Miller (1987) who basically describe a PT as “a system of beliefs, values, and goals that define the structure, process, and outcomes of a program” (p. 22). , from whichever definition we use, however, serves the same functions which includes the identification of “resources, activities,

and outcomes of a program and the causal assumptions that connect these” (Wholey, 1987, p. 77).

Based on definitions above, PT is a set of statements specifying resources, activity and context, predicting outcomes, and explaining and recommending how these outcomes will be produced. A PT would tell “a convincing story of the programme’s expected performance”, and would inform the stakeholders (key policymakers, managers and interested groups) about what the problem is and how the programme could address it (McLaughlin & Jordan, 1999, p. 66). The definitions satisfy the conceptualisation provided by Chen (1990) as they all show some elements of what Chen described as the descriptive and prescriptive nature of programme theories. The descriptive aspects, also called Causative Theory, examines how a programme (intervention) works by predicting and specifying conditions under which certain processes would be activated and their possible consequences (Chen, 2005). The prescriptive aspects, also called Normative Theory, provide guidance on prioritising outcomes and on best approaches for designing and implementing the intervention (treatment) (Chen, 2005). In my study, the PT may serve both of these purposes.

2.3.2 Functions and benefits of constructing a Programme Theory

Constructing a PT has a number of functions and benefits to different stakeholders. Since my study aims to align with the PT of the MEdME programme in Namibia, the functions and benefits described here would also serve as justification for why this study is significant and why it should be carried out. In a paper dedicated to explaining the functions of a PT, Bickman (1987) outlined ten different functions of PT in programme evaluation. They are briefly discussed below:

2.3.2.1 Contributing to social science knowledge

Social science theories can be derived from a range of inputs including the studies in which the researcher intervenes in a situation, or investigates the implementation of an intervention “to determine the effects of that intervention” (Bickman, 1987, p. 7). In evaluation research the main purpose is normally to determine the effects of an intervention (a programme) which was/is being implemented. This articulates well with Chen and Rossi (1983) who conclude that evaluation research can be an important source of social science theory. This however is not obvious for every programme evaluation conducted. Bickman (1987) stated that a programme evaluation can only make an important contribution to social science theory “if the programme and the measures of the programme outcomes are theoretically meaningful” (p. 7). It is thus

argued that only a programme evaluation which is underpinned by a PT can contribute significantly to social science theory.

2.3.2.2 Assisting policymakers

Bickman (1987) contends that generally “social policymakers are interested in programmes and in programme evaluations that incorporate theories” (p. 7). This is because policymakers want something which can be generalised, and that is what a PT offers. By studying the PT of a programme, policymakers can make comparisons and try to determine if the outcomes of the evaluated programme can be achieved by another similar programme. This however is done with the cognition that “generalising the effect of a programme to different populations, times, or locations is a major concern” because the change of context may affect the outcomes of the programme (Bickman, 1987, p. 7). Regardless of the criticisms levelled against generalisation as explained by Mayring (2007), Bickman (1987) asserts that a PT can assist policymakers to make reasonable predictions of the outcomes of their own programme. In my study for example the PT can assist policymakers in making predictions on what is likely to happen to the MEdME graduate in Namibia.

2.3.2.3 Discriminating between theory failure and programme failure

According to Bickman (1987), “failure to find programme effects can be due to either the wrong theory, faulty evaluation design or the programme not being properly implemented” (p. 7). By using or completing a PT one would have the bases and evidence of where exactly the failure emanates from. This is because PT outlines what the programme is and how it brings about the outcomes. Also, at the conclusion of a PT, important questions are asked regarding the intervening mechanisms which made the programme work. Answering such questions may assist the stakeholders and the evaluator to empirically determine the cause in cases of failure.

2.3.2.4 Identifying the problem and target group

A programme is typically designed to solve identified problems for a targeted population. A PT should therefore be able to clarify the relationship between the programme and the problem. The embedded implicit hypothesis of the PT is that: “if the right resources are used for the right activities for the right population, then the activities will produce the results the programme was designed to achieve” (Wholey, et al., 2010, p. 10). However, it is possible for a programme to be implemented with a group or for a problem for which it is inappropriate. Through a PT, such a mismatch between problem and target group could be identified and be addressed. This

is relevant to my study because I anticipate understanding the view of the graduates on whether the MEdME programme matches the needs of the students and the mathematics education field.

2.3.2.5 Providing programme implementation description

According to Bickman (1987), a good PT should go beyond just describing the components of a programme, but further specify the relative importance of these components. Identifying these components is therefore important as it can help in ensuring a smooth implementation of the programme and also to enable the implementers to test the theory if the need arises. Bickman (1987) therefore suggests that the most crucial question the evaluator ought to ask the programme director is: “what aspect of the programme, if left out, would doom the programme to failure?” (p. 12). The answer to this question can enable the evaluator to know some of the most central components of the programme. Since a programme is a complex body comprising of intertwined components, a clearly articulated PT can assist in making explicit the most critical components.

2.3.2.6 Uncovering unintended effects

One of the benefits of describing a PT is that it enables the evaluator to assess the outcomes of more than what was envisaged by the programme designer and implementers through the programme’s objectives, which are sometimes politically influenced. These outcomes may be positive or negative. The PT can enable the evaluator to “depart from political objectives and instead focus on objectives that can be inferred from the operation of the theory” (Bickman, 1987, p. 12).

2.3.2.7 Specifying intervening variables

Typically a PT provides links between the operation of the programme inputs and its envisaged outcomes. By developing a PT the evaluator helps in making these links explicit.

2.3.2.8 Improving formative use of evaluation

PT can provide a way of reasonably predicting the intermediate outcomes of a programme before the ultimate outcomes manifest themselves. If the intermediate outcomes show that the ultimate outcomes are likely not to be achieved with the current implementation strategy, for instance, the evaluator can help the implementers on how they can improve the implementation strategies to ensure that the ultimate objectives will be achieved. So by theoretically describing the effects and assumptions of the programme, the evaluator can often provide corrective actions for the programme implementers.

2.3.2.9 Clarifying measurement issues

The PT specifies the components of the programme to be measured and how they can be measured. A PT therefore can help the evaluator to “develop and choose the correct measures that are valid for the program” (Bickman, 1987, p. 13). Without the PT the evaluator may not be sure of which measures are validly related to the programme under evaluation.

2.3.2.10 Improving consensus formation

In programme evaluation, the stakeholders in the programme have a crucial role to play. Their inherent interest in the programme makes them valid sources of information about the programme’s inputs, implementation activities and possibly the outcomes. In Bickman’s words, “the stakeholders’ implicit theory of the programme may in fact be an important underlying construct that should be studied” (Bickman, 1987, p. 13). This suggests that the evaluator should not take up the task of designing the PT alone but should seek the perceptions of the stakeholders. Involving stakeholders in this exercise can help them understand the limits of the programme, which may eventually lead to more realistic expectations. In my study there is an involvement of stakeholders including the programme’s graduates and the staff members who have been core to the programme and its implementation.

2.3.3 Approaches to developing/constructing a Program Theory

Leeuw (2003) provides a review of three approaches to constructing a PT. However, despite the differences, all Leeuw’s approaches are centred towards discovering the underlying assumptions held by different stakeholders about how the programme is believed to work to achieve its outcomes. Once these assumptions are made public and reviewed, they can then be tested. I found a variety of literature which agree with the approach of constructing a PT where the evaluator follows what is termed the stakeholder approach (Donaldson, 2001; Kirkpatrick, 1998; & Wholey et al., 1987). However, Chen and Rossi (1980, 2007) provided a different approach which they call a social science approach.

In summing up the discussion on issues in constructing a PT, Chen (2005) concludes that there are three different approaches one can follow in constructing a PT: “stakeholder approach, social science approach and integrative approach” (p. 10). Below I discuss the three approaches to constructing a PT as recommended by Chen (2005).

2.3.3.1 Stakeholder approach

In this approach, the evaluator should seek the stakeholders' perspectives through interviews and relevant documents analysis (Wholey, 1987). According to Chen (2005), a PT is relevant only in so far as it reflects the stakeholders' values. Stakeholders should, therefore, be asked for their perceptions and expectations of the relationship between programme resources (inputs), activities and the outcomes. Document analysis of "programmes' legislation, regulations and guidelines, budget justification, monitoring report, report of programme accomplishment or any other documents" can also provide relevant data (Chen, 2005, p. 11). The data from these inquiries should help the evaluator garner comprehensive information for the programme being evaluated. The elements of a PT includes programme resources, activities, outputs viz. short-, intermediate- and longer-term outcomes, as well as the contextual factors, viz. antecedent variables and mediating factors (Sidani & Sechrest, 1999) (these elements are discussed later in this section).

2.3.3.2 Social science approach

This is an approach advocated for by Chen and Rossi (1980, 2007) where evaluators are advised to derive a PT from the existing body of knowledge and from direct observations of the programme in operation. Chen and Rossi warn evaluators against uncritical acceptance of stakeholders' viewpoints because the reality of the programme may not necessarily be accurately reflected here (as they are normally based on intuition or common sense). A PT based entirely on stakeholders' viewpoints, therefore, is likely to fail to grasp all the complicated causal processes underlying the evaluated programme. We are also reminded that official goals are not always operative goals (Perrow, 1961) hence we cannot rely too heavily on documents. The evaluator should therefore not construct a PT based entirely on document analysis. Chen and Rossi (1980; 2007), therefore propose that evaluators should utilize their own experience and knowledge of the programme, in addition to considering the social science theories, in constructing the PT. This may better facilitate the understanding of programme structure, processes and outcomes.

2.3.3.3 Integrative approaches

This approach synthesizes and combines the two approaches discussed above. The stakeholder approach "facilitates the classification and development of stakeholders' views", whereas the social science approach expands the PT by connecting it to social science theory (Chen, 2005, p. 12). Here, after the stakeholders' views are sought, the evaluator would use social science theory to construct an alternative PT based on their knowledge, experiences, and observations.

The integrative approach is adopted in my study because it encompasses a broader dimension of views which is likely to capture rich and meaningful data for the PT of the MEdME programme.

2.3.4 Elements of a Programme Theory

There are six elements of a PT: “problem definition, critical inputs, implementation issues (activities), mediating processes, exogenous factors, and expected output” (Lipsey, 1993, p. 11). A complete PT should reflect all the six elements and they are discussed below.

Problem definition: Here the evaluator outlines the problem the programme is meant to solve or the gap which the programme is meant to address. By describing the “nature and level of severity of the problem for which the programme is given, the evaluator makes explicit the essence of the program” (Lipsey, 1993, p. 11 and Sidani & Sechrest, 1999). In my study, problem definition includes the description/definition of the problem that the MEdME is meant to address, and the justification of why the programme is believed to be one of the possible solutions for the problem.

Critical Inputs: under this element the evaluator specifies the necessary resources required for the successful implementation of the programme (Sidani & Sechrest, 1999, p. 230). These resources may include the physical, intellectual, human and financial resources (Adams et al., 2003). Physical resources are “assets including facilities, equipment, land, and other assets” which can support the successful implementation of the programme (Adams et al., 2003, p. 13). Intellectual resources are “non-physical, intangible resources like brand, patents, and even partnerships” the programme needs for its successful implementation (Othman et al., 2015, p. 123). Human resources are staff members who are needed for the successful implementation of the programme, And financial resources include “cash and other lines of credit” needed for the successful implementation of the programme (Adams et al., 2003, p. 274).

Implementation issues: here the evaluator describes the actions to be taken in order to implement the programme successfully (Sidani & Sechrest, 1999). The description should specify the “services to be offered, the activities to be performed, or the procedures to be followed in delivering the programme, and also the amount, frequency, and duration of the service” (Sidani & Sechrest, 1999, p.230). In my study, the implementation issues also include a description of the rationale and challenges experienced during the implementation and evolution of the programme. With the inputs outlined, under this element a further description

is given of how the resources are put to use so that the programme is successfully implemented. This element may provide answers to such questions as: what actions are involved in the implementation and why are those actions believed to yield the intended outcomes, for instance in my study, with regard to the graduates?

Mediating processes: This element entails the identification of the intervening mechanisms, i.e. “the causal processes underlying a program so that the reasons why a program does or does not work can be understood” (Chen, 1990, p. 191). Here the evaluator describes what happens in the black box, including the mechanisms which lead to outcomes and the patterns of change i.e., what exactly do the implemented activities do in the clients which leads to the anticipated outcomes? The evaluator makes explicit how the activities lead to short-term outcomes, how short-term outcomes lead to intermediate outcomes and how ultimate outcomes eventually occur (Rosen & Proctor, 1978).

Exogenous factors: include “contextual factors” that will significantly affect the pattern of changes which would occur in the client after receiving the programme services (Lipsey, 1993). These may include antecedent variables, which include the characteristics of the programme recipients, environmental factors, the economic factors of the individual recipients and also those of the organisation. The mediating factors may include changes in general and legislative influenced factors which are core to the programme implementation such as staff, policies and other politically influenced factors.

Expected Output: These are the outcomes, representing the anticipated effects of the programme. According to Wholey et al. (2010) outcomes are changes or benefits which result from programme activities. A PT theory should specify the nature and the timing of the outcomes (Chen, 1990; Lipsey, 1993). Such outcomes should allow the readers to compare the programme’s effects to the programme’s objectives. In my study, the objectives of the MEdME on which the observable outcomes are based, are: graduates’ reflexive practices (RP); career trajectory (CT); research capacity (RC), and contribution to mathematics education transformation in Namibia (METN).

Programmes typically have “multiple, sequential outcomes”, sometimes called “the programme’s outcome structure” (Wholey et al., 2010, p. 9). First, there are short-term outcomes, which are the “changes or benefits that are most closely associated with, or “caused” by, the program’s activities” (Wholey et al., 2010, p. 9). Second are intermediate outcomes,

which occur as a result of the short-term outcomes. And finally are the longer-term outcomes – also called programme impacts – which follow from the intermediate outcomes (Wholey et al., 2010).

2.4 CONCLUSION

In this chapter, I have described and categorized my study as a programme evaluation study. The programme to be evaluated in my study is the MEdME with the focus on what the graduates perceive as the impact of this programme on their reflexivity, research capacity, career trajectory and on mathematics education transformation in Namibia. I have also indicated in this chapter that to allow me to get a deeper understanding of the graduates' perspectives, I grounded my study in the Programme Theory. By this I mean that my study attempts to align with the PT of the MEdME programme in Namibia. Because of this underlying theory, my study can be branded as a Theory-Driven Programme Evaluation. Underpinned by a theory, my study is structured such that it consists of all the elements of a PT, including: problem definition, critical inputs, implementation issues (activities), mediating processes, exogenous factors, and expected output. My assumption is that by making explicit all the elements of the MEdME programme theory, I will be able to answer my research questions which inform the rationale for my research project.

CHAPTER 3

RESEARCH METHODOLOGY

3.1 INTRODUCTION

In this chapter, I present the research methodology that enabled me to achieve the following research goals: (1) to evaluate the MEdME against its stated objectives; and (2) to evaluate the impact of the MEdME on the graduates and on the mathematics education terrain in Namibia. To present the said research methodology, this chapter discusses the research orientation; research method; research design; my research sample and the sampling method; the data collection methods and tools; and the approach to data analysis. Finally, I discuss the issues of validity and reliability for this research; ethical considerations; some limitations of this study and the challenges experienced during this research project.

3.2 RESEARCH ORIENTATION

My aim in this research project was to establish how the RU MEdME programme has impacted on its graduates in the context of the mathematics education terrain in Namibia, from the perspectives of its graduates. I therefore situated my study in the interpretive paradigm. According to Bassey (1999), the interpretive paradigm aims at advancing “knowledge by describing and interpreting the phenomena of the world to get shared meanings” (p. 44). This paradigm was suitable for this study as it helped me to generate insights for understanding the shared perspectives of the MEdME graduates regarding the effects of the MEdME programme on the graduates’ reflexive practices (RP), career trajectory (CT), research capacity (RC) and their perspectives towards mathematics education transformation in Namibia (METN). This insightful understanding was generated from the graduates’ responses to the questionnaires and to the recall interviews. Since my study is underpinned by the evaluation theory which requires the consideration of the MEdME programme’s theory, only some elements of the PT were elicited from the Rhodes University (RU) staff members who have been core to the MEdME programme, through interviews. The interpretive paradigm therefore also enabled me to understand the shared perspectives of the RU staff members.

The above information shows that in my study I engaged deeply with the graduates and some RU academic staff members. In the interactions with these participants, I included a number of open-ended questions in both the questionnaire and interviews to collect qualitative data. However, some closed-ended questions were also included, which generated quantitative data. My study therefore adopted a mixed method approach with a central premise that “merging

qualitative and quantitative approaches in one study provides a better understanding of the research problem” (Creswell & Clark, 2018, p. 42).

3.3 RESEARCH METHOD

This study took the form of a programme evaluation as discussed in Chapter 2. In my study, I evaluated the impact of the MEdME programme against its objectives from the perspective of its graduates. The data was collected from the graduates through an MEdME theses audit, questionnaires and interviews. To align well with the underpinning theory (i.e. PT), some data regarding some elements of the MEdME programme theory were generated from the Rhodes University (RU) staff members who have been core to the MEdME programme, through an interview with each of them. The collected data was then analysed. My units of analysis had four foci: (1) critical reflexivity (CR); (2) career trajectory (CT); (3) research capacity (RC); and (4) contribution to mathematics education transformation in Namibia (METN).

3.4 RESEARCH DESIGN

My study unfolded in three phases: (1) Thesis audit; (2) Consent, distribution and analysis of questionnaire; and (3) Interviews.

Phase I: Theses audit

In this phase, I conducted an audit of all the MEdME programme graduates’ theses, whereby I read all their theses – particularly the rationale, research goals and the findings sections. The main purpose for doing this theses audit was to scrutinize what each graduate researched and group them into themes. These then guided my sampling process of participants to be interviewed. There was therefore a need to analyse the data obtained in the audit so that possible grouping could be done. Since all the theses were basically an attempt to improve mathematics education in Namibia, I considered it prudent to group the theses according to the six National Council of Teachers of Mathematics (NCTM) principles which “are fundamental to high-quality mathematics education” as discussed in the NCTM (2000, pp. 12-24). The NCTM principles (viz. themes) are: (1) *Equity* – these theses addressed issues of equity and social justice in mathematics education; (2) *Curriculum* – these theses are framed by issues of the Namibian mathematics curriculum (e.g. syllabus, schemes of work, textbooks, etc.); (3) *Teaching* – these theses focussed on pedagogy in mathematics; (4) *Learning* – these theses focussed on learners’ cognition and the learning process; (5) *Assessment* – these theses addressed issues of assessment in mathematics education; and (6) *Technology* – these theses were framed by issues of technology such as ICT in mathematics education.

In considering these themes, I was cognisant that they may inevitably overlap, i.e. one thesis might have addressed more than one theme, or a thesis might not have addressed any of the listed themes at all. I therefore ensured that my sampling could accommodate these cases. I also recognised that other themes might emerge as the audit unfolded, and in such cases, I made provision for these new themes to be incorporated into my sampling procedures.

Phase II: Consent distribution and analysis of questionnaire

In this phase, I contacted each of the graduates of the MEdME 2007-2018 programme through different platforms e.g. phone calls, emails, or where required, text messages. This initial engagement was to introduce my study to each one of the graduates and allow the graduates to buy into the significance of my research project. During this engagement, I also asked the individual graduates to indicate the platform they preferred to be contacted through, so that we could maintain a professional atmosphere and good communication. According to Jaison (2018), the “strength of qualitative research methods often lies in the formality of the communication... in the research process” (p. 19). Since my study had a qualitative component, I therefore considered the efficiency of communication between the participants and me as of the essence.

After the initial communication was done, I sent a consent letter to each of the graduates. The consent letter aimed to inform the graduates about my study and invite the graduates to participate in my study by completing a questionnaire. I then sent a questionnaire to each of the graduates who each indicated their availability and willingness to participate in the study as a participant. To make a process of filling in the questionnaire easier, I designed it in such a way that it could be filled in electronically. Since an electronic questionnaire can easily be tampered with, I locked the document with a password and only left the answering section editable. There were, however, some participants who preferred to complete the questionnaire manually. To cater for these participants, there was another version of the questionnaire which was designed for that purpose. The letters and the questionnaires were sent to the participants through emails or WhatsApp, depending on the participants’ preferences.

Phase III: Interviews

There were two different types of interviews. The first type of interview was conducted with selected MEdME graduates. This interview aimed at following up on the questionnaire to allow the selected participants to provide deeper information regarding the outcomes of the MEdME.

The second type of interview was conducted with the RU academic staff members involved in the MEdME since its inception. The reason for interviewing the academic staff members was to learn about the design of the programme and its rationale, and also their perspectives on the contribution of the MEdME programme to graduates' professional lives.

3.5 SAMPLING METHOD AND SAMPLES OF THE STUDY

In the first two phases of my study, I intended to work with all the graduates who were willing and able to participate. Firstly, I audited their theses that I accessed through the RU theses repository. I then sent a questionnaire to all the graduates and invited them to participate in my study by completing it. From the theses audit I selected one participant from each NCTM theme for interview purposes. This selection was also done so that each of the following career trajectory categories (CTC) were represented: promoted, transferred, changed job and remained in the same job/position. To pave the way for the selection in terms of the CTCs, I included a question in the questionnaire which asked participants to summarise their CTCs (for detailed selection criteria, see ethics section).

For the MEdME academic staff members' interviews, only those who have been core to the MEdME programme since its inception were interviewed.

3.6 DATA COLLECTION METHODS

This research study made use of three methods of data collection, namely: document analysis, questionnaires and interviews. Each method is discussed in detail below.

3.6.1 Document analysis

Document analysis is a "systematic procedure for reviewing or evaluating documents...in order to elicit meaning, gain understanding, and/or develop empirical knowledge (Bowen, 2009, p. 27). In my study, document analysis was done in the form of a theses audit as discussed in Phase I in 3.4 above.

3.6.2 Questionnaire

Phase II of my study entailed the distribution of a questionnaire to all the MEdME graduates. In the questionnaire, participants were asked to state their main motive of enrolling and their expectations from the MEdME programme, to what extent their expectations were met, and also how the MEdME has affected their professional lives. The questionnaire also asked participants about their career trajectories before and after the acquisition of the MEdME, i.e. whether they experienced career advancement. The questionnaire further asked about the contribution of the MEdME programme towards the graduates' research capacity.

Data from the questionnaire was then used together with the data from the interview, in answering all three research sub-questions. Data from the questionnaires was also used together with the theses audit in sampling for interview purposes.

3.6.3 Interview

In my study, an interview was conducted with each of the selected participants and also with the MEdME programme's academic staff members. Interviews allow for in-depth probing (Kabir, 2016). I therefore interviewed the selected participants in order to get more in-depth data to supplement the data from the questionnaire.

The interview with the MEdME academic staff members aimed at eliciting data about the six elements of the MEdME PT. The elements as described in Chapter 2 include: problem definition, critical inputs, mediating processes, implementation issues, exogenous factors, and the expected outputs.

All the interviews were recorded using a voice recorder and transcribed. Each interview transcript was saved as a separate document.

3.7 DATA ANALYSIS

In this section I outline the programme theory which enabled me to analyse and tell the story of the MEdME programme, based on its PT elements. The diagram (Figure 3.1) below shows the MEdME PT framework.

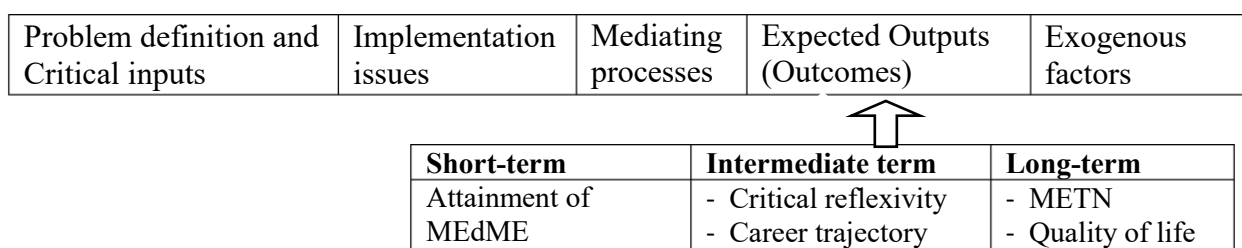


Figure 3.1: The MEdME Programme Theory framework

In Figure 3.1 above the *problem definition* includes the description/definition of the problem that the MEdME was meant to address. The *critical inputs* are all the physical, intellectual, human and financial resources needed for the successful implementation of the MEdME programme. The *implementation issues* of the MEdME programme include the description of the activities that can help in solving the identified problem and how the problem-solving process is executed. The *mediating processes* include the reasons why a programme works or does not work to solve the problem it was meant to solve. The *expected outputs* include the outcomes and possible impact of the programme, pertaining to the students who go through it. And the *exogenous/contextual factors* are the factors which are believed to have an influence on the implementation of the MEdME programme positively or otherwise. All these data were elicited from the staff members who have been core to the implementation of this programme.

From the MEdME graduates, I elicited data regarding their perspectives on the *outcomes* of the MEdME programme with regard to the four themes addressed by my research sub-questions: the graduates' reflexive practices (RP); career trajectory (CT); research capacity (RC), and mathematics education transformation in Namibia (METN). The data from both the questionnaires and the interviews was grouped according to these themes. These themes are based on the overarching objective of the MEdME programme which is to develop and grow critically reflexive practitioners who will actively contribute, and have the capacity to act as agents of change in the transformation process of Mathematics Education in Namibia. This objective can be broken down into short, intermediate and long-term intended outcomes.

Developing and growing critically reflexive practitioners was considered as a direct short-term outcome of the programme. Actively contributing and acting as an agent of change is a direct result of being a critically reflexive practitioner, hence this was considered as an intermediate outcome of the programme. The transformation of Mathematics Education in Namibia can be a direct result of the efforts of the agents of change and will have a far-reaching effect on the future of mathematics education in the country. It was therefore considered a long-term outcome of the MEdME programme.

Data regarding the attainment of the MEdME and the developing and growing of critically reflexive practitioners were considered as short-term outcomes. Data about how the graduates' career trajectory and research capacity impacted on their capacity to be agents of change was

considered as intermediate term outcomes, while data about the participants' views on how their inherent enrolment in the MEdME programme enabled and informed mathematics education transformation in Namibia (METN) was considered as a long-term outcome of the MEdME.

My dissertation therefore tells a story of what short-term outcomes were achieved, to which intermediate outcomes they led to, and eventually how the intermediate outcomes informed the transformation agenda of mathematics education in Namibia, if at all.

3.8 VALIDITY AND RELIABILITY

As a researcher I wanted my readers to trust the findings of my study. I therefore used the following techniques to increase the validity of my study:

3.8.1 Triangulation

I applied two different types of triangulation in my study. Firstly was the *triangulation method* which involved the use of multiple methods of data collection about the same phenomenon (Denzin, 1978, p. 301). In my study I used questionnaires and two different interviews (i.e. for graduates and for academic staff members) to collect data. This allowed me to compare data from these different tools and get a clearer view about the programme and its outcomes. Secondly, I applied *data triangulation* which involves the collection of data from different types of people to gain multiple perspectives (Denzin, 1978, p. 295). To ensure this, participants' selection ensured the coverage of a wide range of participants as explained in 3.5 above.

3.8.2 Member checking

This includes giving participants an opportunity to check and approve particular aspects of the data and the interpretation of the data they provided (Doyle, 2007). In my study I gave the interview transcripts and the interpretations of the transcripts to the interviewees for them to verify the accuracy of the information and the interpretation. Interviewees were asked to edit, clarify, elaborate, and if needed, delete their own words from the narratives. This ensured the true value of the data to ensure external validity (Creswell & Creswell, 2018).

3.8.3 Validation of analysis

I was mindful that my supervisor has been and continues to be a key person in the MEdME programme which was being evaluated. Supervising the evaluation of your own programme inevitably raises issues of validity. I therefore involved my co-supervisor, an experienced academic in interpretive analysis and a person who is not involved in the MEdME programme, to verify and critically scrutinize my analysis and interpretation of the data. This person also acted as a critical friend.

Further, I was mindful that I was interacting with peers, similar in age and in qualification (as products of the MEdME), hence it was possible that as my participants they could give me the answers they thought I wanted. To mitigate against this, I engaged an outside person to conduct the interviews on my behalf. This person was neutral and had no known relation to or interest in either the MEdME or Rhodes University. This person however is a skilled interviewer who was able to probe. Having an outside person involved ensured distance and minimized familiarity which I believe avoided biased responses to my interview questions. Involving an outside person also encouraged interviewees to be both honest and critical of the programme. The interviewer however needed to be familiar with the participants' responses to the questionnaire, hence I had to brief him carefully.

To further strengthen the validity of my findings, I allowed for peer examination, where I allowed my supervisors to be “a mechanism of critiques” (Wilmot, 2015, p. 49) intended to “keep the inquirer honest” (Guba & Lincoln, 1982, p. 247). As experienced researchers therefore, my supervisors helped me to be honest about my study and contribute to deepen my reflexive analysis.

3.9 ETHICAL CONSIDERATIONS FOR THIS RESEARCH PROJECT

I complied with all the ethical protocols prescribed by the Rhodes University Ethical Standards Committee (RUESC) – Human Ethics (HE) sub-committee. This allowed me to have RU staff members as participants in my study (see Appendices F). I also obtained written consent from all the participating graduates and RU staff members (see Appendices C).

I clearly explained the objectives of the study and possible contribution of the research to the research participants, to RU and to the Namibian mathematics education terrain. I used fictitious names (e.g. P1, SR2 etc.) for identifying the research participants, in order to maintain their confidentiality and anonymity. I also ensured that only I and my supervisors had access to the audio recordings of the interviews. In addition, I informed all the participants in this

study that their participation was voluntary and that they had a choice to withdraw from the research at any time if they wished. Lastly, I maintained professionalism at all times during this study to avoid bias of any sort.

3.10 CONCLUSION

This chapter discussed the methodology used in this study and explored a number of key ideas. The chapter described the research orientation; research method; research design; the research sample and the sampling method; the data collection methods and tools, and the approach to data analysis. Issues of validity and reliability, the limitations and the challenges, as well as the ethical considerations were also discussed in this chapter.

CHAPTER 4:

ANALYSIS, FINDINGS AND DISCUSSION OF THE SURVEY

4.1 INTRODUCTION

This chapter presents the analysis, findings and discussions of the data obtained in Phase II of my study. Phase II of my study entailed the distribution of a survey questionnaire to all the MEdME graduates. I sent my survey questionnaire to all the 35 MEdME graduates and 21 of them responded positively by returning them. This chapter therefore presents the analysis of the data from those 21 questionnaires. The questionnaire consisted of five parts, hence the findings are presented in five key sections, namely: 4.2. Part I: Contextual information; 4.3. Part II: Career trajectory (CT); 4.4. Part III: Mathematics education transformation in Namibia (METN); 4.5. Part IV: Reflexive practices (RP), and 4.6. Part V: Research capacity (RC). The data from the questionnaires therefore provided perspectives of the participating graduates on the outcomes of the MEdME programme with regard to graduates' RP, CT, RC, and METN.

4.2 PART I: CONTEXTUAL INFORMATION

4.2.1 Introduction

The questions analysed in this section pertain to the contextual information about the graduates who were participants in my study. There were four questions in this section of the questionnaire which aimed at capturing information about: (1) which yearly cohort they belonged to; (2) what motivated them to enrol for the MEdME programme; (3) their expectations from the programme; and (4) to what extent their expectations were met or not. The aspect identified by participants in questions 2 and 3 were closely related, hence these two questions are discussed simultaneously. Table 4.1 below summarises the participants' responses to the first question.

Table 4.1: Background information about the participating graduates

Year	Participants	Codes	Thesis type
2007-2008	4	P1, P2, P3, P4	Half thesis
2009-2010	3	P5, P6, P7	
2011-2012	4	P8, P9, P10, P11	
2013-2014	1	P12	
2015-2016	4	P13, P14, P15, P16	Full thesis
2017-2018	5	P17, P18, P19, P20, P21	
Total	21	21	

The data in Table 4.1 above shows that 12 (57.1%) of the 21 participants are from the half thesis cohorts, whilst 9 (42.9%) participants are from the full thesis cohorts. This information is important because the responses to the questions in the questionnaire may have been influenced by the particular content of the full-thesis or half-thesis course the participants went through. Figure 4.1 below summarises the distribution of the 35 graduates who were eligible to be participants in my study.

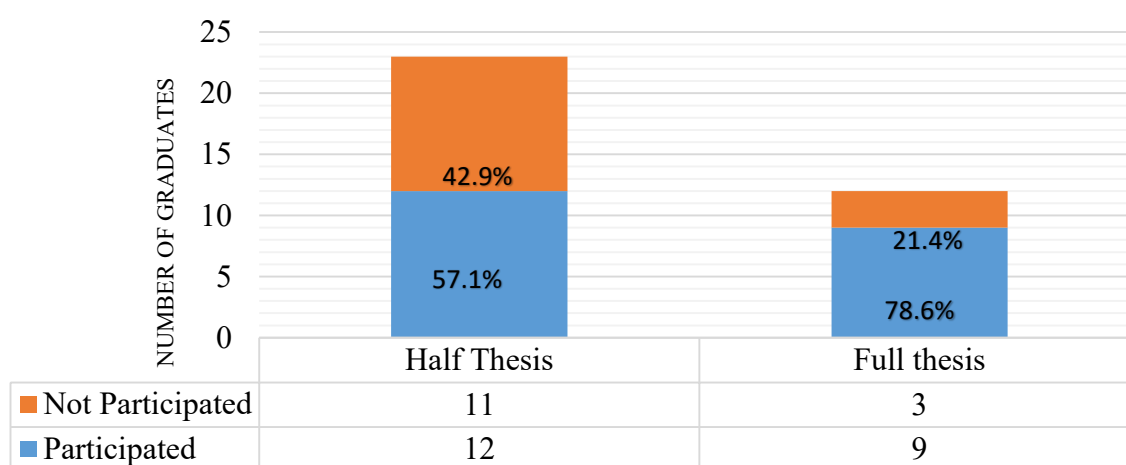


Figure 4.1: Distribution of the 35 graduates eligible to be participants

4.2.2 Motivation for enrolment and participants' main expectations

The participants were asked what motivated them to enrol for the MEdME and what their main expectations from the programme were. The motivation to enrol included: passion in mathematics education; to engage with a mathematics problem; RU quality of academic supervision; RU's rating, personal reputation, professional development, mathematics content

and pedagogical knowledge; to improve academic writing skills, and for career opportunities and financial gain.

Five (23.8%) of the participants (P3, P4, P6, P12 and P21) enrolled for this programme because of their passion for mathematics education and mathematics teaching. According to the Cambridge Advanced Learner's Dictionary, being passionate about something means "having, ...strong beliefs or interests" (McIntosh, 2013). P3 and P15 explained, "...*I enjoy dealing with mathematics related studies*" and "...*I enjoy assisting learners and other teachers in mathematics*" respectively. These graduates believed that studying mathematics that they are passionate about would inspire them to inspire other people to love mathematics.

Four (19%) of the participants (P3, P5, P8 and P11) enrolled for the MEdME programme because they wanted to engage with specific mathematics related problems. Their expectations were mainly to enhance their job knowledge. P5 enrolled in order to carry out research in the area of word problem, P8 enrolled to investigate the teaching of algebra, P3 wanted to know why most people avoid mathematics education whilst P1 wanted to investigate the integration of technology in Mathematics education. These graduates believed that RU was the best place to carry out these investigations citing, the quality of academic supervision from the RU staff members.

The quality of academic supervision by RU staff members was also cited by seven (33.3%) of the participants (P3, P4, P5, P8, P10, P12 and P18) as the motivation behind their enrolment. P12 explained, "...*My experience from the BEd. (Honours)...* lecturers being always available to assist when required" as what motivated her to enrol. P18 who is also a RU BEd. Honours graduate, stated further that their supervisor during the BEd. honours inspired them to study further. These participants expected similar or even closer supervision during the MEdME programme from their supervisors.

Eight (38.1%) of the participants (P1, P4, P9, P10, P11, P12, P17 and P18) chose to enrol because of RU's rating. P1 stated, "*Rhodes (university) received excellent reviews for high international standards.*" These participants therefore preferred to study at Rhodes University because of its reputation.

Nine (42.9%) other participants (P2, P7, P9, P10, P14, P15, P17, P18 and P20) affirmed that obtaining a MEdME from RU is a boost to their personal reputations. They expected a paradigm shift in themselves which would make them think differently. P20 enrolled, "...*to*

garner the respect and credibility ...and to prove myself as a capable and respectable professional” in society. These nine participants stated that people who study at RU are rated very highly in the society, and they wanted to be rated as such too.

Five (23.8%) of the participants (P2, P13, P16, P18 and P20) believed that they would be highly productive professionally if they went through this programme. P18 needed continuous professional development in the field of research in mathematics because his work at the time involved a lot of mini research. P16 felt that acquiring a BEdHons was significant but not sufficient. She further “*...wanted to expand the knowledge and help my learners who were not performing at the time*”.

P2, P7, P9, P14 and P15 enrolled because they wanted to improve their mathematics content and pedagogical knowledge. P2, P7 and P9 all wanted to gain relevant skills and theories about mathematics education. P15 aimed to change his teaching by learning “*...how to teach learners to be good thinkers and problem solvers...*” while P14 wanted to improve his mathematics subject content knowledge.

Improving academic writing was also cited as a motivating factor by P14 stating that he “*...struggled to write a research...*” when he was doing his BEd Honours. He therefore expected to improve his academic writing and gain enhanced research capacity.

Finally P20 and P16 were motivated to enrol by their expectations to broaden their career opportunities and secure financial gain. P16 explained, “*At that time I was getting frustrated being a teacher for close to 10 years with no promotion, I believed getting a higher qualification from a reputable university will make it easier to get a promotion*”.

Figure 4.2 below illustrates the number of participants who identified each of the nine motivation factors discussed above.

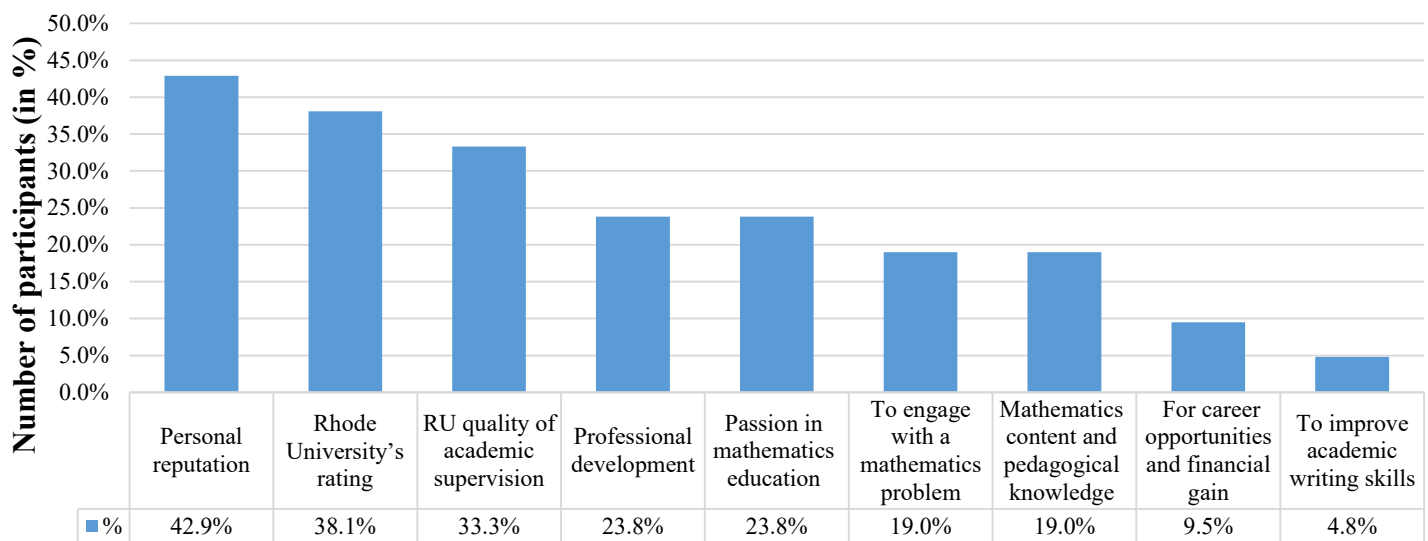


Figure 4.2: What motivated participants to enrol for the MEDME?

4.2.3 The extent to which the expectations were met

In the last question of part one of the questionnaire I asked the graduates to describe generally the extent to which their expectations from the MEDME programme were met. There were four different degrees of satisfaction: (1) exceeded expectation, (2) met all expectations, (3) met some of the expectations, and (4) did not meet any expectations. None of the participants chose option 4.

Six (28.6%) of the participants (P1, P4, P7, P10, P9 and P12) indicated that the programme exceeded their expectations. P1 explained that the support from her “*supervisor was amazing*” and it was more than she expected. The other participants explained that they learnt more than just the research skills they expected. P9 for instance stated that she “*gained more content knowledge of proportion, ratio, fractions and algebraic fraction ...which I missed during the lower tertiary phase*”.

Ten (47.6%) of the participants stated that their expectations were fully met. P3, P5 and P17 completed the programme within the given period, which was their expectation. P6, P15, P19, P20, P16 and P18 expected professional growth, increased job knowledge (and promotion in case of P18) and that is what they got from the programme. P19 and P18 were equipped to reflect on their own and on others’ teaching practices which was their expectation from the programme.

The remaining five (23.8%) of the participants (P2, P8, P11, P13 and P14) had some of their expectations met and other expectations not met. The met expectations included: *“increased professional competence in mathematics education”* as highlighted by P11; and a good understanding of research processes as explained by P8. The participants who expressed reservations about their expectations included P2, P8 and P14. P14 for instance explained, *“The programme did not offer any mathematics content at all”*.

Figure 4.3 below presents the distribution of the graduates’ satisfaction.

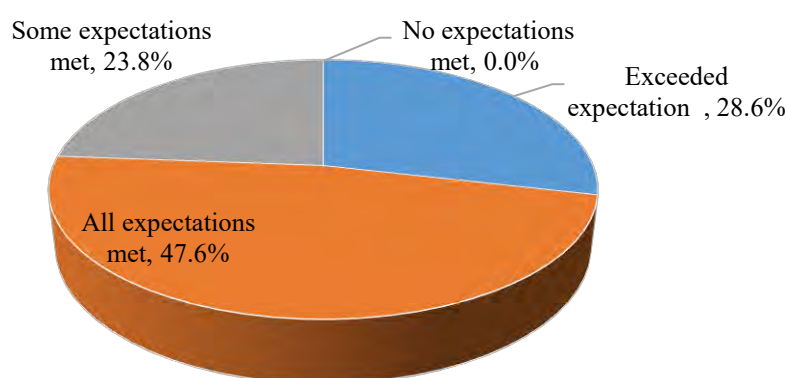


Figure 4.3: Participants' degree of satisfaction

4.3. PART II: PARTICIPANTS' CAREER TRAJECTORIES

4.3.1. Introduction

In this section I analysed the data about how the MEdME programme may have influenced (or did not) the graduates’ career trajectories, professional lives as well as their quality of life. There were five questions under this phase. Questions 1 and 2 asked for participants’ career trajectory before and after obtaining their MEdME. There were four career trajectory categories (CTC) in which the participants’ trajectories were expected to fall: (1) promoted, (2) transferred to another duty station, (3) remained in the same job and duty station and (4) changed to another job outside Ministry of Basic Education (MBE). Question 3 asked how the MEdME had contributed (or did not) to the graduates’ career trajectory. Question 4 asked how the MEdME programme influenced (or did not) their professional lives (i.e. the way they do their job) and question 5 asked them how the programme influenced (or did not) their quality of life generally.

4.3.2. Career trajectories before MEdME

The data from question 1 indicated that nine (42.9 %) of the participants had been promoted within the ministry of basic education (MBE) shortly before enrolling for the MEdME. Those

participants who were promoted within the MBE (P1, P5, P6, P7 and P8) became Heads of Department (HODs), P14 became a principal, and P2, P3 and P4 became education officers. The remaining 12 (57.1%) of the participants (P9, P10, P11, P12, P13, P15, P16, P17, P18, P19, P20 and P21) all remained in the same position and duty station. Figure 4.4 below illustrates this data.

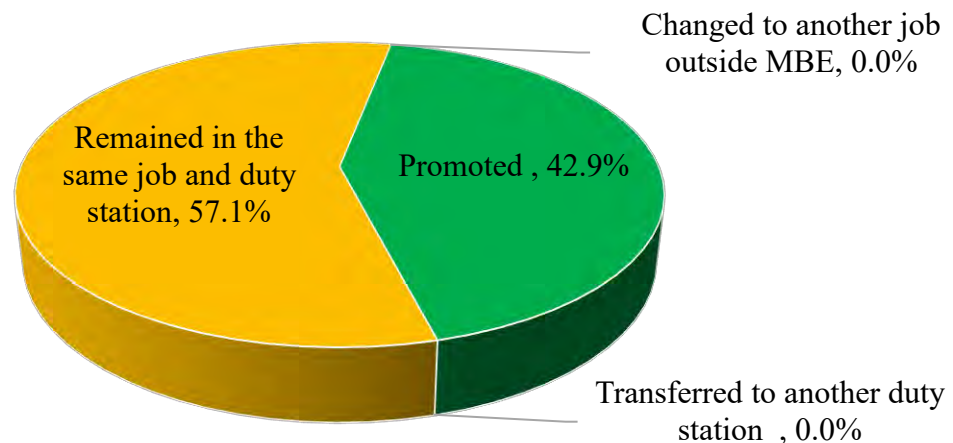


Figure 4.4: Participants' career trajectories before obtaining the MEdME

4.3.3. Career trajectories after obtaining the MEdME

After obtaining their MEdME participants' careers went through different trajectories. There were still four CTCs as listed above. Seven (33.3 %) of the participants (P4, P5, P6, P7, P9, P12 and P21) were promoted within the MBE. P12 became an HOD, P5, P6 and P9 became education officers, P4 became a chief education officer, while P7 became a school principal. These seven participants are serving in these positions to date. The data further indicated that P10 and P11 transferred to other duty stations after obtaining an MEdME degree.

Eight (38.1%) of the participants (P3, P8, P13, P14, P15, P17, P19 and P20) remained in the same position and same duty station even after graduation. Some of these participants (P3, P8 and P14) were in promotional positions before they obtained the MEdME and they remained there. P19 and P20 are still looking for promotion opportunities and P19 preferred a job outside the teaching fraternity. P18 has not attempted to apply for a promotional post stating that he "...still needed to devote my time and focus on continuing with my studies".

Five (23.6%) of the participants (P1, P2, P11, P13 and P16) changed to jobs outside the MBE. P1, P11 and P13 became lecturers (teacher educators), whereas P2 and P16 moved into vocational education and training (VET). Figure 4.5 below compares the participants' career trajectories before and after obtaining an MEdME.

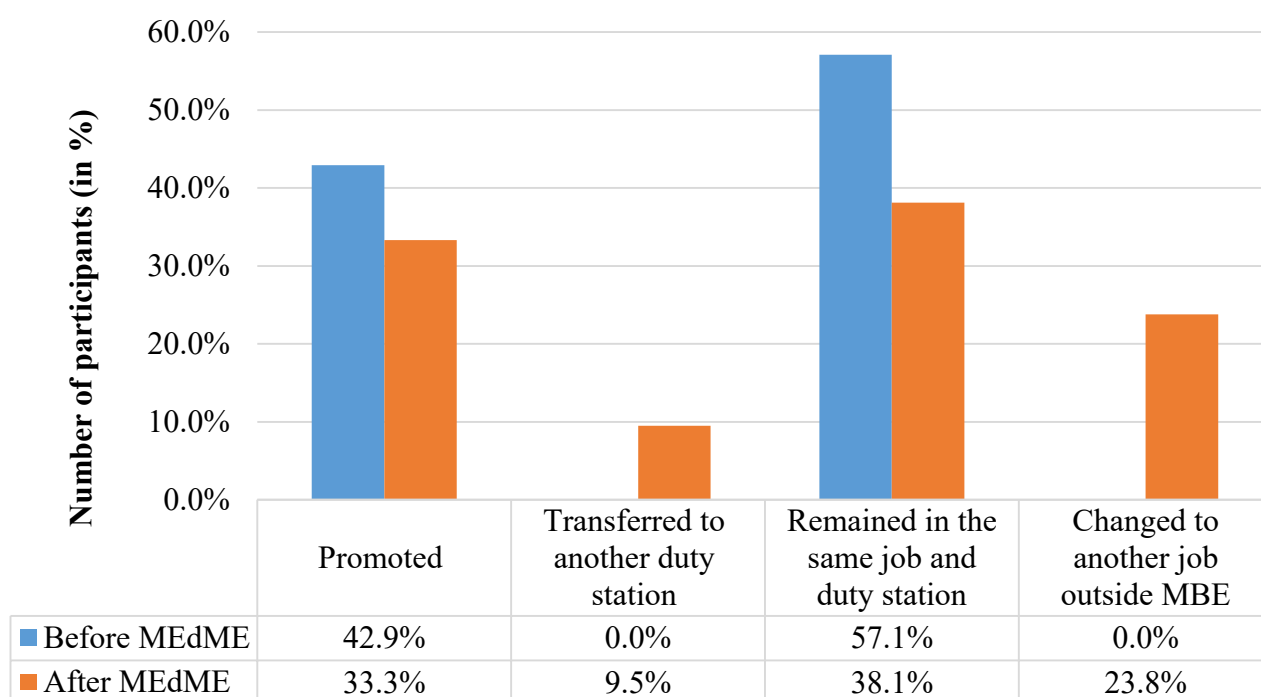


Figure 4.5: Participants' career trajectories before and after obtaining an MEdME

From Figure 4.5, it is evident that there were a lot of trajectories across all the CTCs after the MEdME, unlike before the MEdME where only two CTCs were represented.

Generally, all the participants started their careers as teachers and only six (28.6%) of the participants (P10, P15, P17, P18, P19 and P20) remain as teachers to date. The other 15 (71.4%) participants experienced career advancement. This data is illustrated in Figure 4.6 below.

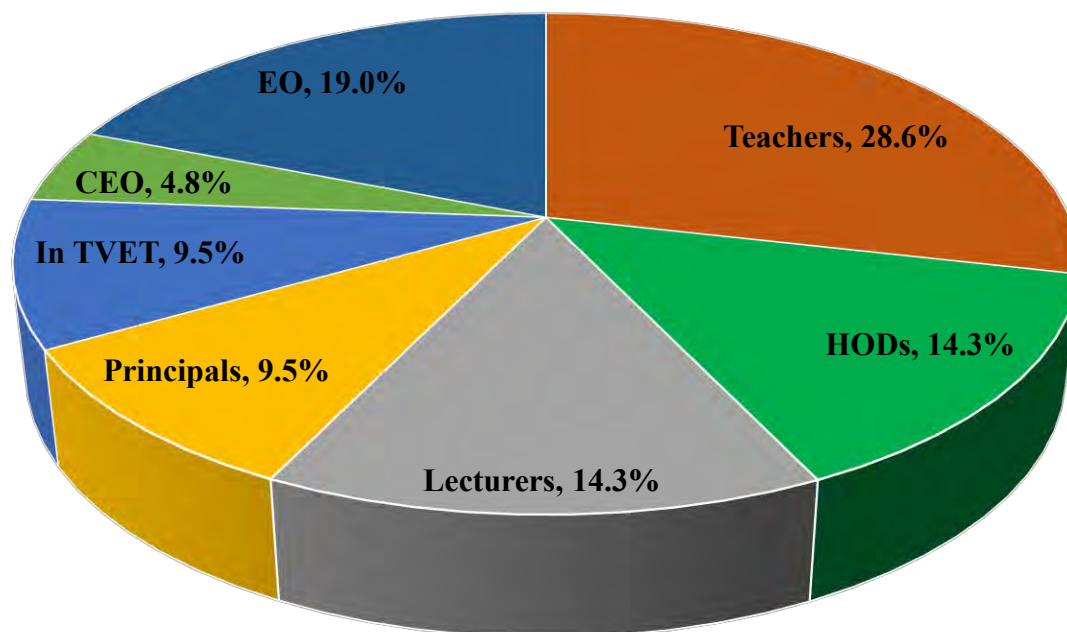


Figure 4.6: The current positions held by the participating graduates

4.3.4. The MEdME contribution to participants' career trajectories

Participants were asked to describe how the MEdME contributed (or did not) towards their career trajectories. Generally, the participants indicated that the MEdME had: (1) influenced their promotions, (2) opened up promotional opportunities and (3) opened up opportunities for further studies.

Ten (47.6%) of the participants (P1, P2, P4, P7, P9, P10, P11, P12, P13 and P21) believed that the MEdME had influenced their appointments to particular positions. P1, for instance, believes that the progress in her studies was “...*enough to convince the appointing authority... to consider me as a suitable candidate for the maths post*”. P9 was in demand after obtaining an MEdME and was shortlisted for every promotional post she applied for and “...*eventually became a regional senior education officer for mathematics*”.

Apart from those who believed that the qualification influenced their appointments, three (14.3%) of the participants (P15, P20 and P21) believe that the attainment of the MEdME has opened up promotional opportunities in their careers but these participants have not yet taken

up these opportunities. P15, for instance, stated that there have been so many opportunities for promotion but she is “...*much selective as to where...*” she would like to work. This “...*is the reason why I am still a teacher today after attaining my masters*”.

The attainment of a MEdME also opened up opportunities for further studies. P1, P7, P11 and P13 all believed that they were not only encouraged, but also enabled to study further by the attainment of the MEdME. P1 explained “... *MEdME paved a way...for me to enter academia*”. P7 believes that the MEdME offered her “...*opportunities to find scholarships ...as well as a chance for PhD admission at a reputable university*”.

There are however two (9.5%) of the participants (P8 and P18) who believe that the MEdME programme has not yet had any influence on their career trajectory. P8 explained, “*There has not been any salary increment after obtaining the MEdME*” while P18 has “...*not yet tried to make use of it to seek such opportunities.*”

Finally, there were five (23.8%) participants (P5, P6, P16, P17 and P19) who did not make any comment about whether and how the MEdME contributed to their career trajectory (or did not). Figure 4.7 below illustrates how the MEdME influenced the participants’ career trajectories.

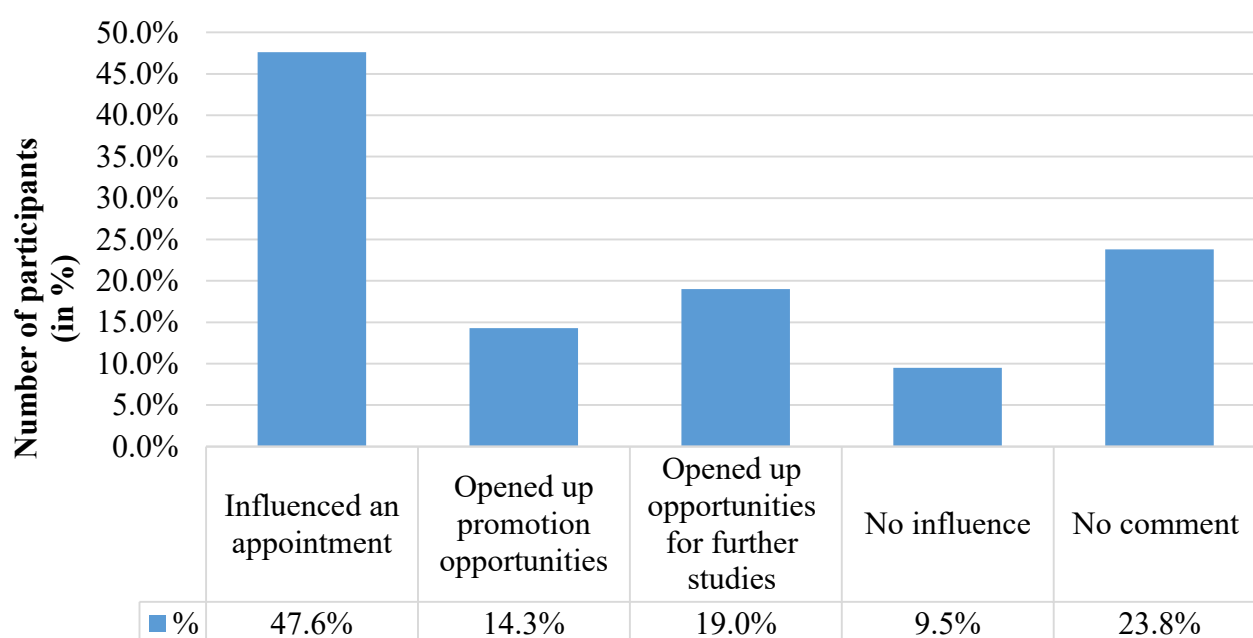


Figure 4.7: How the MEdME influenced the participants' career trajectories

4.3.5. The MEdME contribution towards participants' professional lives

The fourth question asked participants to describe whether and how the MEdME influenced their professional lives (i.e. the way they do their jobs). Overall the participants cited seven different aspects in which their professional lives had been influenced. These included improved: pedagogic knowledge, leadership skills, time on task, skills on building healthy relationships at work, analytical skills, confidence in mathematics education, and reflective skills.

Twelve (57.1%) participants (P3, P5, P6, P7, P8, P10, P11, P14, P15, P17, P19 and P20) believe that the MEdME programme enhanced their pedagogic knowledge in different ways. P3, P5 and P6 who are all mathematics education officers in different regions, believed they improved how they support teachers. P6 for instance was enabled “...to support Mathematics teachers professionally and show them different approaches of teaching and learning Mathematics effectively;” and to “... encourage teachers to believe in every child's potential in mathematics”.

P10 believes that she “...became a better teacher ...teaching pupils for life instead of just for them to pass the national exams. She further explained that she “...developed better ways of explaining concepts and also learnt to be relaxed when the pupils struggled because literature ascribed to this”. P15 also became a better teacher because he learnt to use technology more in his presentations. He explained, “Visualisation with GeoGebra has made it easier” for him to explain many geometrical concepts.

Five (23.8%) of the participant (P1, P8, P14, P18 and P21) believe that professionally the MEdME programme influenced their: leadership skills, time on task, and relationships at work. P1 stated that she served in “...a number of leadership positions ...for the past 9 years, the programme prepared me ...to thrive in all circumstances”. The programme also helped P18 to learn how to manage his time well and now he is self-driven in doing his job. He explained, “...My actions have truly become professional ...and colleagues even tell me they notice the changes”. P8 on the other hand acknowledged that the programme helped him to improve his skills “...in building healthy relationships ...with the colleagues”.

Eleven (52.4%) other participants (P3, P4, P5, P9, P11, P13, P14, P16, P19, P20 and P21) explained that their analytical skills had been enhanced. According to Rafis, (2018) analytical skill is “the ability to take big pieces of information, ...and deconstruct them to identify the

...systematic trends ...which bring them together (p. 2). P20, for instance, “*learnt to think more critical and to pay attention to details*” a skill he claimed to have learnt during data analysis.

Four (19%) of the participants (P3, P10, P11 and P12) cited the confidence in mathematics education that the MEdME programme developed in them. P3 now “...*possess[es] confidence when rendering support to the mathematics teachers*”.

Finally, P11 and P16 believe the MEdME programme taught them to practice regular reflection in their professional settings. P16 has “...*grown to become a critical reflective mathematics teacher, always ready to question the status quo*”. P11 believes the programme consolidated her “...*ability to reflect on my lessons*” and became a better teacher and eventually a good lecturer. Figure 4.8 below summarises the participants’ views on how the MEdME influenced their professional lives.

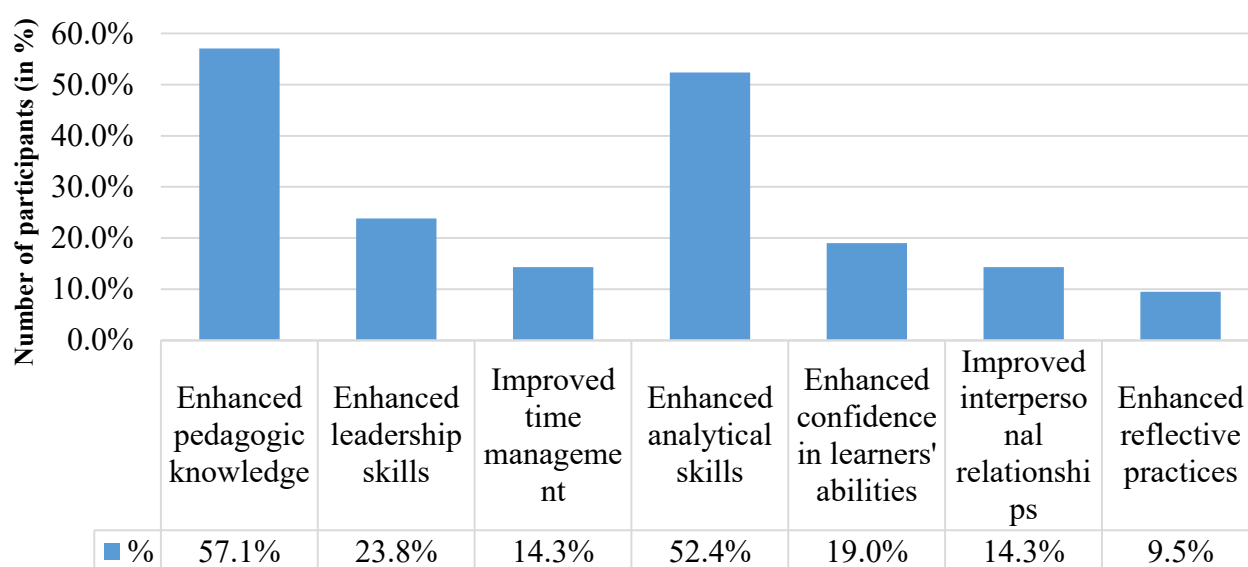


Figure 4.8: The MEdME’s influence on participants' professional lives

4.3.6. The MEdME’s influence on the participants’ quality of life

Question 5 generally asked how the MEdME programme influenced (or did not influence) the participants’ quality of life. According to Cella (1994), quality of life (QoL) is “an individual's perception of their position in life ...and in relation to their goals, expectations, standards and concerns” (p. 187). Accordingly the participants agreed that the MEdME programme has influenced their QoL in seven different ways: ability to think critically and creatively, self-esteem, financial status, ability to work under pressure, ability to collaborate with other scholars, respect for other people, and ability to manage work stress.

Four (19%) of the participants (P6, P9, P14 and P16) believed that the programme has influenced their ability to think critically and creatively which made them resourceful people in society. P14, for instance, is now a “...*resourceful person in the region especially in integrating technology in mathematics education*”.

Eight (38.1%) of the participants (P3, P5, P8, P10, P11, P12, P15 and P20) believed that their self-esteem has been influenced positively by the MEdME programme, they feel proud of themselves and they have a positive outlook on life in general. P11 clarified: “...*Being a Rhodesian graduate alone gives me great pride*”, P20 believes that the programme boosted her “...*self-esteem and sense of self-worth*”, whereas P10 became “...*one of the respected people in the society*” and she could get better treatment and services in the society.

Five (23.8%) of the participants (P1, P4, P6, P7 and P11) learnt to respect other people through this programme. P4 explained, “*The programme made me to value teachers in rural schools more because I have learned that what they are doing is massive*”. P1, P6, P7 and P11 all recognised their lecturers’ respect towards students which taught them that respecting your learners and every other person will not make you any less of what you are. P11 therefore “*feels less guilty lately because my students are freer with me than before*”.

The qualification also comes with some financial enhancements. This was confirmed by five (23.8%) of the participants (P1, P7, P10, P11 and P13) who could now afford a better life as the MEdME qualification comes with a bit of salary increment either directly for some government employees, or through promotion.

Five (23.6%) other participants (P8, P14, P18, P20 and P21) can now manage their personal lives well and more easily than before going through the MEdME programme. P20 stated that she is now “...*less affected by anxiety*” whilst P18 believes that she has “...*learnt to be a critical person and not take things at face value*” which improved her interpersonal relationships. Interpersonal relationships were also cited by P14 stating that he can now “...*critically consider ideas from different people and merge them together to get one working idea*”. Figure 4.9 below illustrates the MEdME’s influence on the participants’ quality of life.

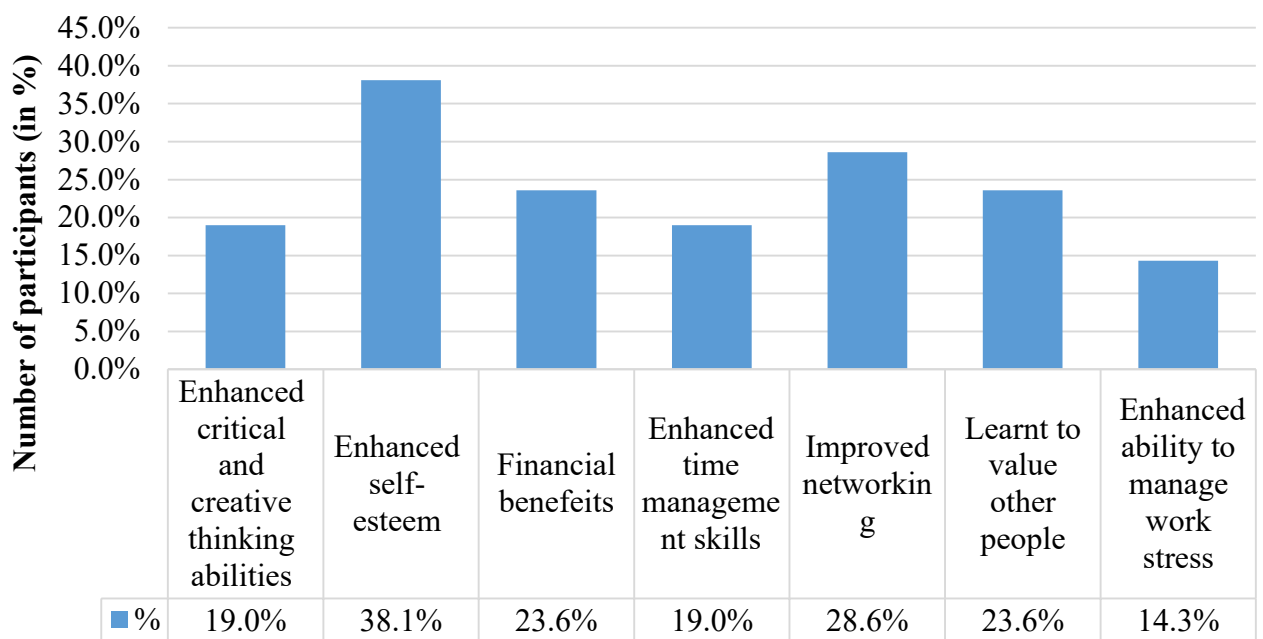


Figure 4.9: The MEDME's influence on participants' QoL

4.4. PART III: MATHEMATICS EDUCATION TRANSFORMATION IN NAMIBIA

4.4.1. Introduction

This part discusses the participants' perspectives with regard to the METN. There were five questions included in this part:

- What types of METN they have observed since they obtained an MEDME.
- The role the participants played in the METN since obtaining an MEDME.
- How their individual MEDME research projects contributed to METN and what should be done to enhance the usefulness of MEDME theses towards METN.
- The types of METN which is still needed.
- Whether and how the MEDME programme in general has contributed (or not) to the METN.

In this section the participants' responses are discussed under two pillars. The first pillar includes the responses about the outcomes viz. questions 1, 2, 3 (first part), and 5. The second pillar are responses about the participants' recommendations viz. question 3 (second part), and question 4.

PILLAR 1: THE OUTCOMES

4.4.2. Transformation observed after the MEdME was obtained

Ten (47.6%) of the participants (P5, P6, P7, P8, P9, P11, P14, P15, P16 and P17) observed that many mathematics teachers in Namibia have lately advanced teacher qualifications and there is an improvement in learners' performance in mathematics. P15 observed that *"new teachers are coming ...with new ideas and approach to the teaching and learning of Mathematics"* and the old teachers are also *"trying to further their studies...which helps them to get new methods and tactics in teaching"*.

P9 observed that *"...nowadays the teaching emphasis is more on learner centred approach (LCA) and ...mathematics is not seen as an abstract subject, but ...a subject that brings real life context to class"*. This is despite findings by Ausiku (2008), who, in her MEdME research project found that there was still a persistence of teacher centred approaches in mathematics in the same region. Does P9's observations suggest that mathematics teachers in that region have started following an LCA? Answering this question may require further research.

P14 and P16 observed that there is a changing mindset in many mathematics teachers towards the use of technology in mathematics teaching which P14 believes *"...enable[s] teachers and learners to experience and explore difficult mathematical ideas in more tangible ways."* P16 also *"...observed the increased use of ICT and other visual aids in mathematics education which contributes to learners' conceptual understanding"*.

According to Kilpatrick, Swafford, & Findell (2002), conceptual understanding refers to "an integrated and functional grasp of mathematical ideas ...to understand why a mathematical idea is important and the kinds of contexts in which is it useful" (p. 118). This understanding increases retention of ideas in learners' minds and can help learners to perform well in mathematics. Against that background, P5 and P7 observed that the academic performance of many learners in mathematics has improved lately.

There is also an improvement in the curriculum structure mentioned by P1, P3, P4, P6, P11 and P21. P4 eloquently explained that the *"introduction of Mathematics for All means that ...all candidates will write common examination papers which are discriminating only with content"*. She further mentioned *"the syllabuses for Advanced Subsidiary (AS) Level which Namibia will introduce come 2021"*.

P6 and P11 (9.5% of participants) observed enhanced teachers' confidence towards the teaching of mathematics. P11 believes *"the mathematics educators are more confident to teach mathematics now than before"*.

Improved collaboration amongst mathematics teachers was also mentioned by P6 who observed that mathematics teachers in her region *"...have formed professional support groups through digital platform where they interact positively. Most teachers are actively participating on those platforms even those who were passive before"*.

There is also an improvement in learners' (both male and female) performance in mathematics. However P10 observed that, *"...More girls are overtaking boys in national ...exams"*. This, she said, might have been as a result of the large number of female mathematics teachers in the system today.

There are however five (23.8%) of the participants (P2, P13, P18, P19 and P20) who have not observed any transformation just yet and no elaboration was provided either. Figure 4.10 below compares the number of participants who believe that there has been a METN to those who believe there has not, whereas Figure 4.11 provides a summary of the types of transformation observed by the participants.

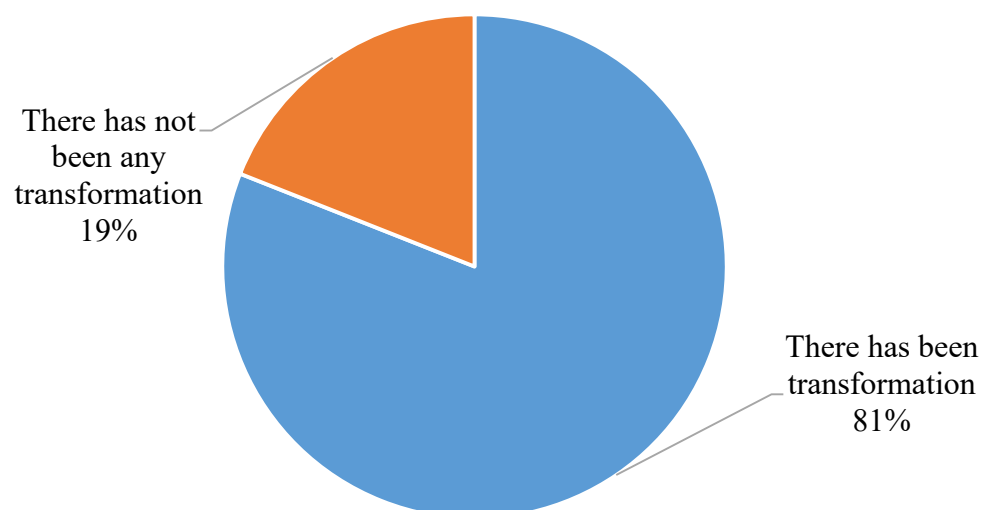


Figure 4.10: General views of participants on METN

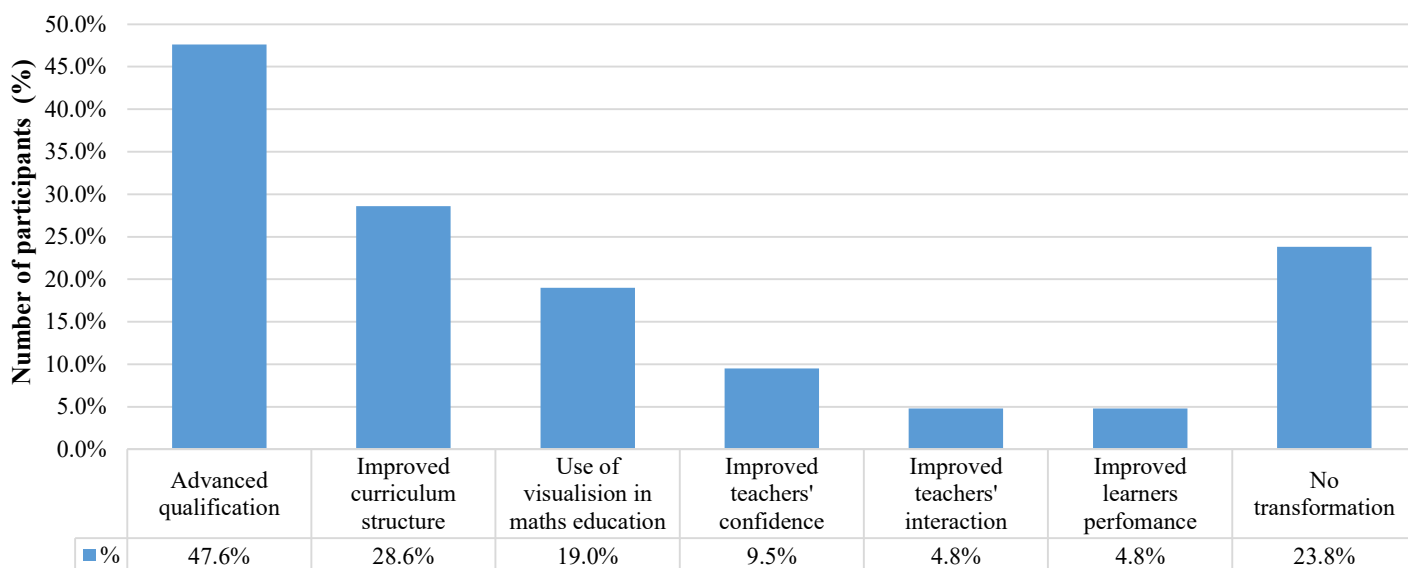


Figure 4.11: Types of METN observed by 21 participants

Figure 4.10 above indicates that only 19% of the participants have not observed any transformation just yet, while 81% of the participants observed a variety of transformations as summarised in Figure 4.11 above.

4.4.3. The role played in METN since graduation

The participants were expected to describe the role that they played in METN since they obtained their MEdME. All the participants responded to this question by describing what they have been and/or are doing to bring about METN; even those who stated that there had not been any transformation. I grouped the individual contributions into six themes, namely through: teacher training, own teaching practices, curriculum development and monitoring, assessment, teacher collaboration, and through encouraging and inspiring other teachers to study further.

Fifteen (71.4%) of the participants (P1, P2, P3, P4, P5, P6, P7, P11, P12, P13, P14, P15, P16, P17 and P18) contributed through teacher training in various ways. P2, P3, P5, P6, P7, P14 and P16 have been involved in training of teachers at regional and/or national level regarding curriculum interpretation. P6 for instance “...had been a trainer of trainers for revised curriculum for Mathematics and presenter at math congress” while P4 has been core in organising the mathematics congress in Namibia since its inception.

P1, P11 and P13 are teacher educators hence they are directly involved in the training of new mathematics teachers. P12, P15, P17 and P18 believe they contributed to the METN through sharing their mathematics education knowledge with their colleagues.

Apart from teacher training, eight (38.1%) of the participants (P2, P7, P8, P11, P15, P16, P18 and P19) believe they contributed through their own teaching practices. P11, for instance, was “*appointed to teach identified mathematics learners with different mathematical needs from various schools in Windhoek*”. P15 started using visuals in her lesson presentation and as a result her learners changed “*...from disliking the subject to liking it...*” and her learners’ academic performance in mathematics have improved.

Five (23.8%) other participants (P3, P4, P6, P9 and P21) contributed to METN through curriculum development and monitoring. P3, P4 and P6 are members of the Mathematics Curriculum Panel (MCP) where according to P3 “*...matters concerning mathematics education in Namibia are discussed*”. P4 is also a member of the Examination, Assessment and Certification Board (EACB) which in terms of article 99(1) of the Education Act 3, of 2020, consists of “all regional [education] directors and other members appointed by the Minister”. As a member of this board, P4 “*...motivate[s] the proposals to go through the Examination Board together with the Education Officer at NIED and the ones at DNEA (Directorate of National Examination and Assessment)*”. P21 mentioned that he “*served in a mathematics panel for curriculum review (MPCR) at NIED*”. The contributions of these participants in the MCP, EACB and MPCR respectively have an impact on the mathematics education fraternity in the whole country.

P2, P3, P6, P7 and P21 (23.8% of participants) contributed to the METN by being involved in setting and/or marking the national assessment items. Assessment is a key aspect in pursuit for mathematics proficiency as it “reflects the mathematics that is important to learn and the mathematics that is valued” (Suurtamm et al., 2016, p. 5). P6 “*...had been a national marker, team leader, assistant chief examiner, chief examiner, and item setter for both JSC and NSSC Mathematics*” in the MBE for over 10 years now. P2 had been “*...involved in the setting and marking of Math assessments papers for TVET*”.

Another important aspect which was cited by four (19%) of the participants (P1, P5, P9 and P11) is teacher collaboration. Teacher collaboration is defined as an engagement “where teachers communicate about classroom experiences in an effort to strengthen pedagogical expertise...” (Poulos et al., 2014, p. 8). P1 identified fractions as a topic many mathematics teachers struggle with, and established a club called Campus Fraction Project “*...where teachers come together to learn how to use visualisation to teach fractions*”. The feedback from the club members is that they now find it easier to teach fractions.

Lastly, P10 and P16 believe that they contributed to the METN by encouraging other teachers to study further. P10 for instance “*encouraged many teachers to pursue a MEdME or any other mathematics related course ...This in itself is already a contribution to transformation*”.

In summary, all the 21 participants believe that they have made a contribution in pursuit of METN. This includes the four participants who earlier stated that they had not yet observed any transformation. The summary of the participants’ contributions is illustrated in Figure 4.12 below.

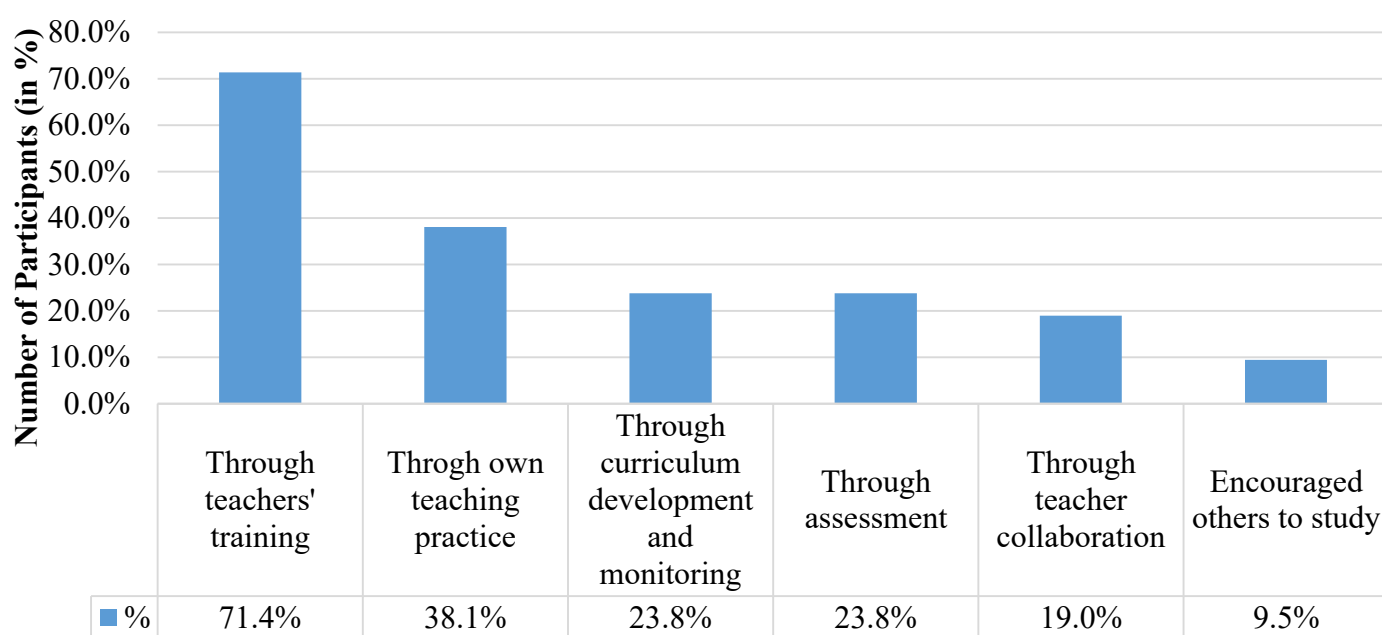


Figure 4.12: Participants' views on how they contributed to the METN

4.4.4. The contribution of individual research projects to the METN

The third question of Part III in the questionnaire had two sections. The first section sought participants’ perspectives on the contribution they believe their individual research projects made towards METN. In the second part, I asked for participants’ recommendations on how to enhance the usefulness of their MEdME theses towards METN. The participants’ responses to the first part of this question are discussed below and the responses to the second part will be discussed under the second pillar which is about recommendations.

Eleven (52.4%) of the participants (P3, P5, P6, P9, P10, P12, P13, P16, P17, P18 and P19) believe that their research project contributed to the METN by influencing their own and their readers’ teaching approaches. P6 researched and hence believes that her thesis has and can

“contribute to the understanding of how to teach from an informed position, by knowing most misconceptions experienced on specific topics”.

P3 observed that the *“continuing professional development (CPD) unit at UNAM used the findings of my research project to train teachers on how to effectively teach geometry”*. P10 noticed that there are teachers who read her thesis and *“...they are following the geometry teaching and learning programme that was the crux of the project to plan their lessons”*.

Apart from those who shared their finding with others, P13, P17, P18 and P19 implemented the findings of their research project in their own classrooms and they are happy with the results. After implementing her recommendations, P19 noticed a big improvement in her learners' understanding of fractions.

The MEdME research projects can also contribute to the general understanding of mathematics education. In her research P1 *“...found that traditional teaching methods have continued in mathematics classrooms despite the adoption of the learner centred education (LCE) approach”*. P7 on the other hand researched and *“...contributed to the understanding of parental involvement in learning of mathematics, with a focus on marginalised learners”*.

There are also three (14.3%) of participants whose theses have been cited by other scholars. P2, P9 and P10 all stated that their respective thesis had been cited by other scholars. This is seen by these participants as a contribution to METN.

Lastly are P2, P4 and P16 who believe that their research projects had a direct influence on the mathematics curriculum. P2 explained, *“...My research ...contributed to compulsory mathematics ...throughout basic education”*. According to the current National Curriculum for Basic Education (NCBE) “mathematics is compulsory up to Grade 11” (Namibia. MoEAC, 2010, p. 48). P4 is an education officer and she believes that her research helped her *“to understand the curriculum development and that assist me to guide and advise the colleagues during the curriculum reforms”*. Figure 4.13 below summarises the participants' theses contribution to METN.

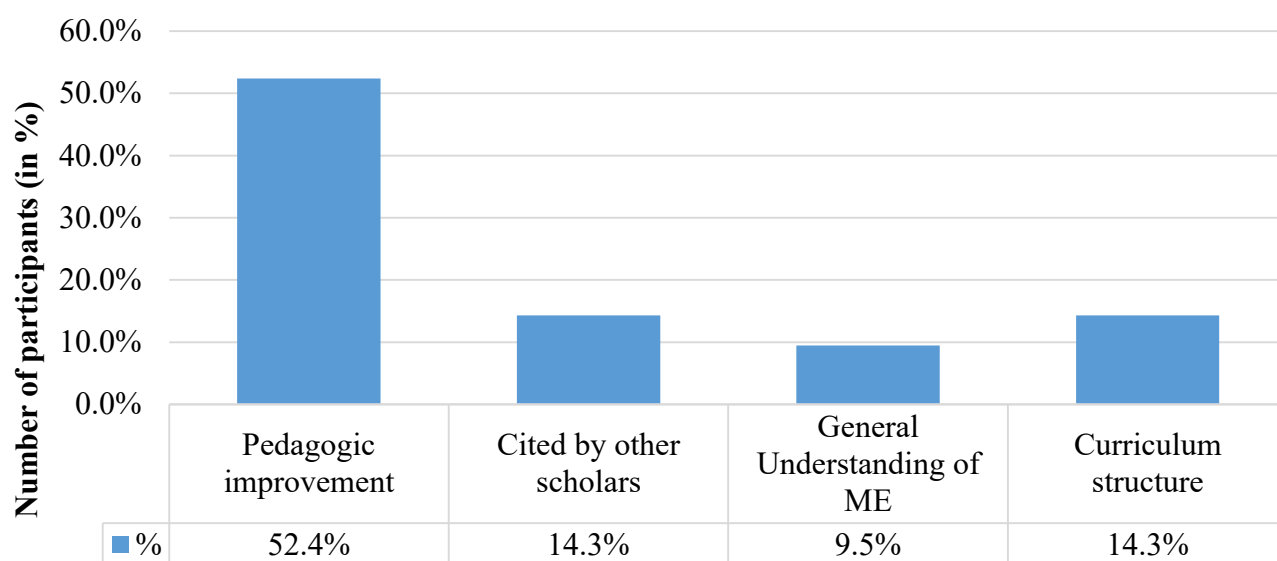


Figure 4.13: Contribution of individual theses towards METN

4.4.5. The general contributions of the MEdME toward the METN

This was the final question (question 5) in Part III of the questionnaire, which asked the participants to generally describe their views regarding the contributions of the MEdME programme towards METN. Some participants observed that the programme has made a contribution and others thought the programme did not make any contribution, while there are also those who were not sure because of different reasons.

Thirteen (61.9%) of the participants (P1, P2, P3, P4, P5, P6, P8, P9, P13, P15, P17, P19 and P21) believe that the MEdME programme has made a significant contribution to METN because many of the graduates of this programmes are occupying key positions in the Ministry of Education. This triangulates well with the participants' responses in Part II question 1, where the data indicated that 71.4% of the participants are promoted to key positions in both the MBE and the Ministry of Higher Education, Training and Innovation (MHETI).

The view of these 13 participants is therefore that the graduates who hold such key positions are using the knowledge from the MEdME programme to influence the development and implementation of the national curriculum. P4, for instance, is a member of the MCP and EACB as discussed earlier, the bodies responsible for the development and monitoring of the implementation of the curriculum in Namibia. She (P4) explained, *"Most of my colleagues who have been participating in the curriculum development were either my classmates or they were in class after my class because my class was the first to do this"*. Therefore, even though the

number of MEdME graduates is small, being in key positions means that they can influence the education system quite easily.

Apart from the graduates holding key positions P4, P11, P16 and P18 observed that the graduates of the MEdME programme are equipped with professionalism and effective teaching approaches. P18 explained, “...I could see the impact of the MEdME on my own subject. I could personally carry out my teaching [more] confidently than before”. Similarly, P6 an education officer, observed that the graduates of this programme are “...equipped with healthy professional working relationship. They are team players and display high working ethics”.

As stated earlier, there were three (14.3%) participants (P12, P14 and P16) who believed that the MEdME programme has not had any notable influence towards METN. P12 believed that the MEdME graduates are too few to make a significant impact on the whole country’s education system. Similarly, P16 observed that “...it’s mostly just the graduates that are practicing what they have learnt and few individuals who are close to them”.

Finally, P7, P10 and P15 who were unsure of how the MEdME programme has contributed to METN. Figure 4.14 illustrates the participants’ views on the MEdME’s general contribution to the METN.

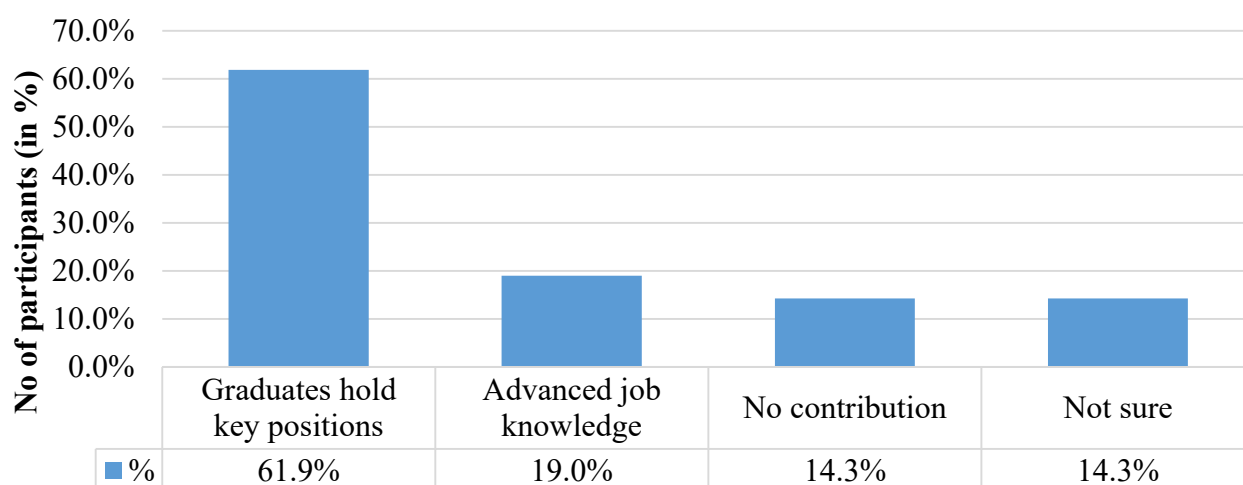


Figure 4.14: The MEdME’s contribution to METN

PILLAR 2: RECOMMENDATIONS

4.4.6. Recommendations on how to make the MEdME theses more useful

This was the second part of the third question which asked participants what they thought should be done, in order to increase the usefulness of MEdME theses in Namibia. Only eight participants responded to this part.

Six (28.6%) of the participants (P8, P9, P14, P15, P16 and P18) commented on the issue of access. P15 explained, “...*as we speak, there is no clear platform where Namibians share their studies and discuss their findings*”. Four (19%) other participants (P7, P13, P18 and P20) therefore thought that the Ministry of Education should work together with the Namibian Research Units (NRU), the regional education officers and the National Institute for Education Development (NIED) to create a platform where graduates’ theses will be shared. P13 recommended that the Ministry of Education should “...*create a research bank to ease the literature enrichment and create a pool of knowledge for future researchers, teachers...*” P18 and P20 further recommend that it is high time that NIED initiate a journal where local education scholars can share their research and papers.

P8, P15, P16 and P18 were all in agreement with P9 that the mathematics congress organisers both at regional and national level “...*should always include slots in which people’s research projects are shared in detail, the summary of these theses can then be shared with the stakeholders*”.

P13, P16 and P20 (19% of participants) were in conformity with P10 who believed that useful research needs funding and “*research funding needs to be driven from top to the last novice researcher, which is not happening in Namibia right now*”. Figure 4.15 below illustrates the participants’ views of what should be done to make the MEdME theses more accessible and useful.

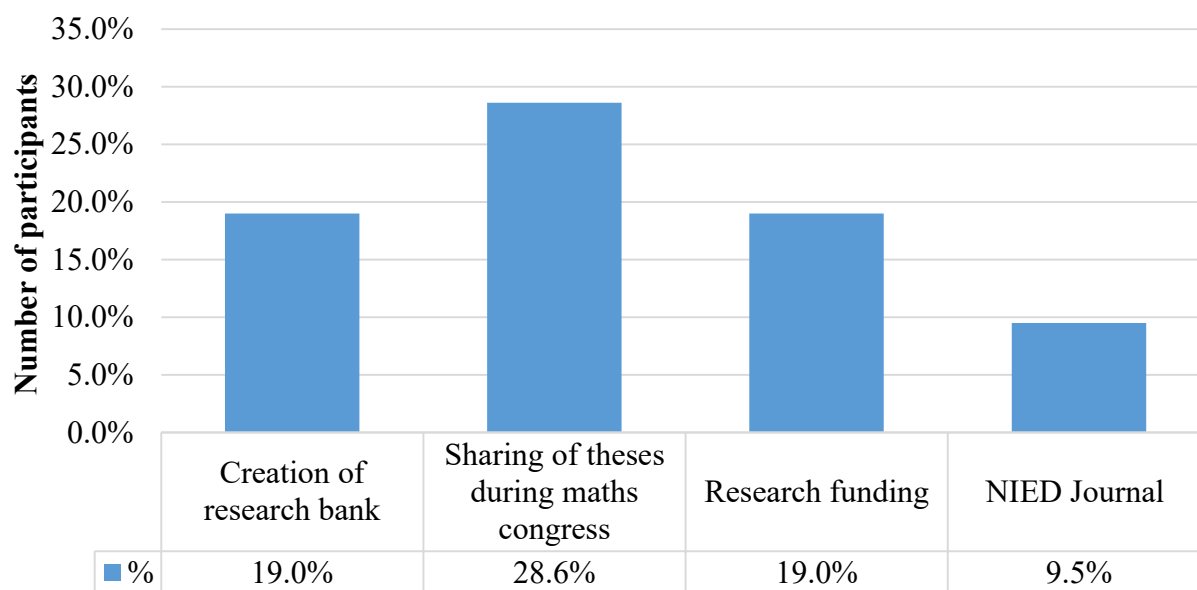


Figure 4.15: Further METN to enhance research usefulness

4.4.7. Further transformation in mathematics education in Namibia

Here the participants were asked what transformation (if any) is still needed in mathematics education in Namibia. Some participants believed that there is still a need for further transformation in some aspects, while others believe there is no need for further transformation.

The participants who saw a need for further transformation mention that the transformation is needed in aspects like: educators' research capacity; the use of visualisations and technology in teaching of mathematics; teaching of mathematics with passion; mathematics teachers' collaboration; curriculum alignments; and on mathematics teachers' subject content updates.

Eight (38.1%) of the participants (P5, P9, P10, P12, P13, P18 and P20) all commented on the need to further enhance mathematics educators' research capacity. P5 and P18, among others, specified that all mathematics educators need to have the capacity to carry out research in their workplaces so that they can investigate possible solutions to issues arising in their workplaces.

Three (14.3%) of the participants (P6, P7 and P16) believe that mathematics teachers need to be motivated to love mathematics as a subject. P6 stated that there is a need for "...*real and passionate mathematics teachers who teach from the heart*". She described a passionate mathematics teacher as the one who teaches a learner wholeheartedly, and who has mastered "...*the skill of switching between teaching mathematics and life skill in a lesson*". P7 added that a passionate teacher would always "...*have programmed timetables for learner support*".

Seven (33.3%) other participants (P6, P14, P15, P16, P17, P19 and P21) believe that mathematics teachers should go beyond the ordinary, and use creative ways to make their lessons interesting. P14, for instance, looks forward to seeing “...*learners introduced to technology such as GeoGebra or other mathematics software to visualise and explore the concept and enhance conceptual understanding*”.

There were also two (9.5%) participants (P3 and P8), who believed that curriculum alignment is key to fostering teachers’ passion towards the subject. P3 mentioned that “...*the mathematics curriculum for Namibia also needs to be aligned with the rest of the SADC region*”. As an education officer he observed that many teachers have a feeling that the Namibian curriculum is below standard when compared to that of other Southern African Development Community (SADC) countries, and this feeling is quite detrimental to one’s passion towards the teaching of mathematics.

Mathematics teachers’ subject content update was also mentioned by P4, P11 and P21 who believe that teachers need further training to enable them to teach advanced content. P4 explained: “*as we are introducing the AS (Advanced Subsidiary) level, we need to ensure that teachers are comfortable with the content they are going to teach*”.

However, P1 and P2 who saw no need for further METN. P1 believes that there has been enough transformation and that all that is needed now is the implementation of all the good recommendations from research done in Namibia. Figure 4.16 illustrates the participants’ views on the METN still needed in terms of teaching and learning mathematics.

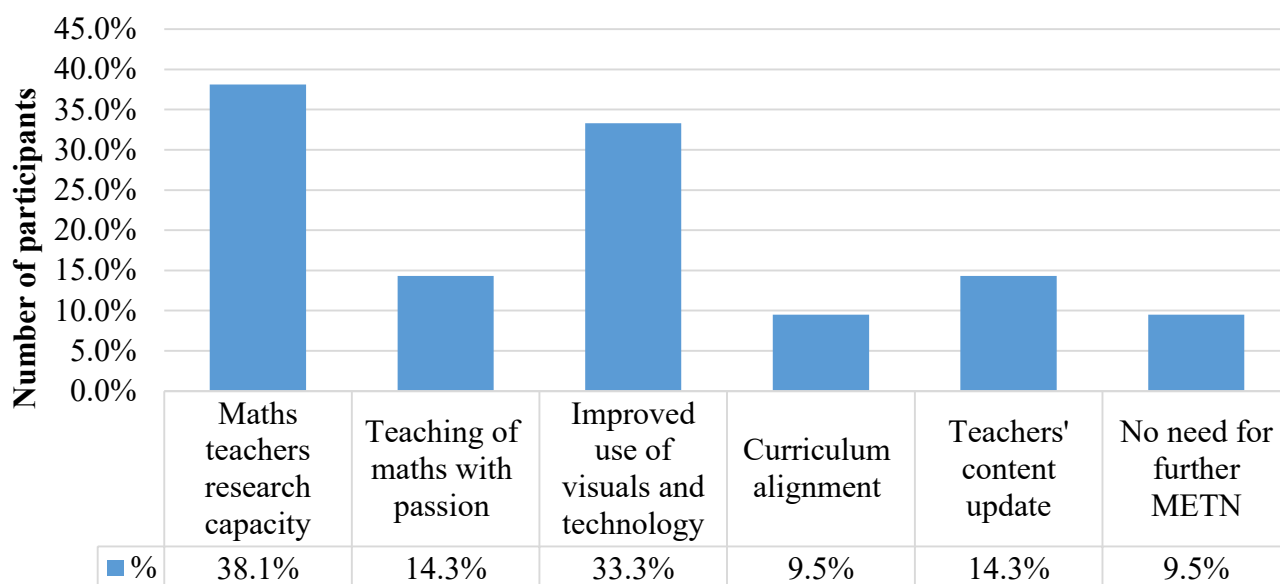


Figure 4.16: Further METN in teaching and learning

4.5. PART IV: CRITICAL REFLEXIVITY

4.5.1. Introduction

Part IV of my questionnaire consisted of three questions. Question one asked the participants whether the MEdME programme had prepared them well enough to be critically reflexive practitioners (CRP), and also what salient aspect(s) they learnt from the MEdME programme (if any) which enabled them to be CRP. In question 2 participants were asked firstly to reflect on whether they believe that they had learnt what the MEdME programme set out to achieve, and secondly, what enabled them to learn as such if they did. The third question asked participants to describe anything else they needed to learn from the MEdME programme to make them more CRP.

4.5.2. What participants learnt that enabled them to be CRP

All the 21 participants believe that the programme prepared them well enough to be CRPs. However, the salient aspects learnt by individual participants differ. The aspects learnt include self-reflection, considering others' ideas in reflection (reflection in context), enhanced research capacity, and improved thinking capacity. Even though these aspects were not listed in any order, I will discuss them in the order listed above.

In Chapter 2 a CRP was described as an individual who reflects on him/herself with the purpose of improving practice. Nine (42.9%) of the participants (P4, P6, P8, P10, P12, P13, P15, P16 and P18) noticed that their *self-reflective* practices had improved because of the MEdME

programme. P4, P6, P8, P10, P12 and P15 all acknowledged that they learnt to be self-introspective, critically analyse what they do daily, and also reflect on their daily work s to improve future practice. P4 emphasized that the self-reflective habit was *“heavily influenced by the journal writing which I was introduced to during the course”*.

P13, who is a lecturer, acknowledged that he is *“...empowered to question the course objectives of courses I lecture and plan accordingly”* and he refuses to teach content that he *“...know does not align with course objectives”*. P18 has learnt to be *“...mindful of the implications of my own actions, personally and professionally”*.

The second aspect listed above is *considering others’ inputs in one’s reflection*. In Chapter 2 it was discussed that a CRP also considers how the perspectives of others might have contributed to a situation at hand (reflection in context). P3, P6, P7, P16, P18 and P19 all acknowledged that they learnt to reflect in context. P7 explained, *“...One cannot lead or have an effective teaching ...without doing reflection particularly on the concerns of the subordinates”*.

The third aspect is *enhanced research capacity*. As discussed in Chapter 2, a CRP should also be a researcher. Five (23.8%) of the participants (P5, P11, P16, P17 and P20) claimed that their research capacity was improved. P20 claimed that her *“...ability to do research and other professional writing”* was the most commendable aspect learnt.

There were also eight (38.1%) participants (P1, P2, P4, P9, P11, P14, P20 and P21) who believe that their thinking capacity has been elevated. I use thinking capacity in this context to mean an ability to think systematically, logically and deeply. P2 claims that he is *“...one of those that have critically analysed our education system and ...recommended for a uniform education system in the country with clear vertical and horizontal articulations”*. He attributed much of his critical thinking ability to the MEdME programme.

In summary, the discussion above indicates that there are four salient aspects learnt by the participants in relation to their respective CRP as presented in Figure 4.17 below.

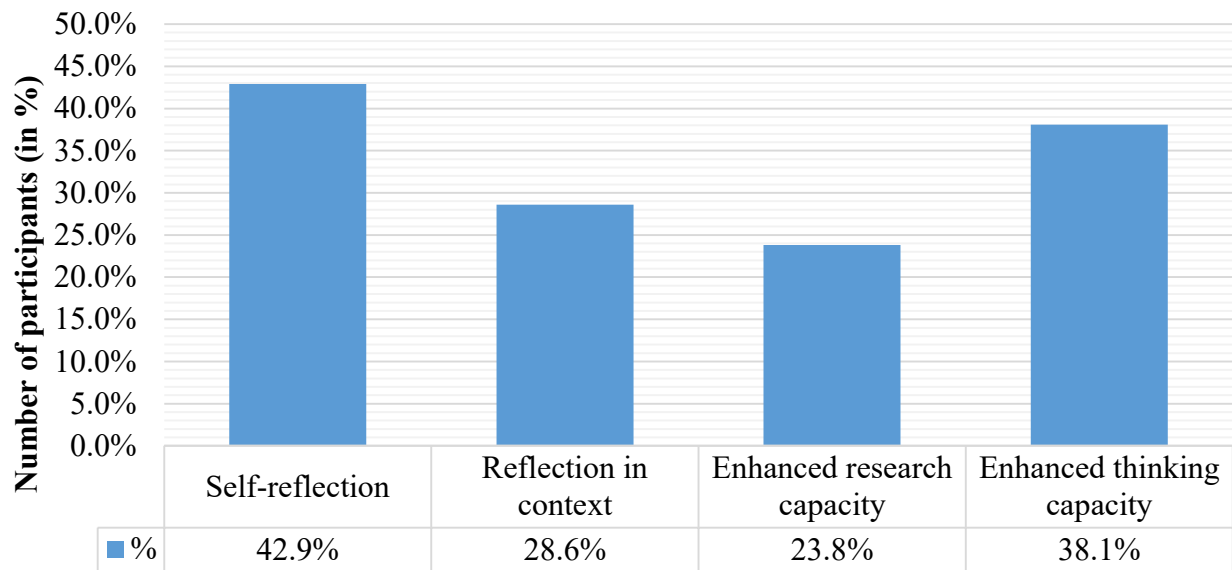


Figure 4.17: Aspects learned in relation to participants' CRP

4.5.3. Did the participants learn what the programme set out to achieve, and what enabled them to learn (or not to learn)?

This question sought the participants' views on whether they had learnt enough of what the MEdME programme offered them or not. The question further asked participants to reflect on what allowed them to learn (or hindered them from learning) what the programme offered them. All the 21 participants indicated that they learnt enough – which triangulates well with the responses in Part 1 – where all the participants indicated that their expectations from the MEdME programme were met, though to different extents.

The discussion below focuses on the main enabling factors viz. what the participants believe was the most significant aspect which enabled them to learn from the programme. I grouped the factors into three themes: positive disposition towards the course, quality of the academic supervision, and hard work and dedication.

Figure 4.18 below presents the number of participants who attribute their learning to the respective themes, which will be followed up in the discussions of these findings.

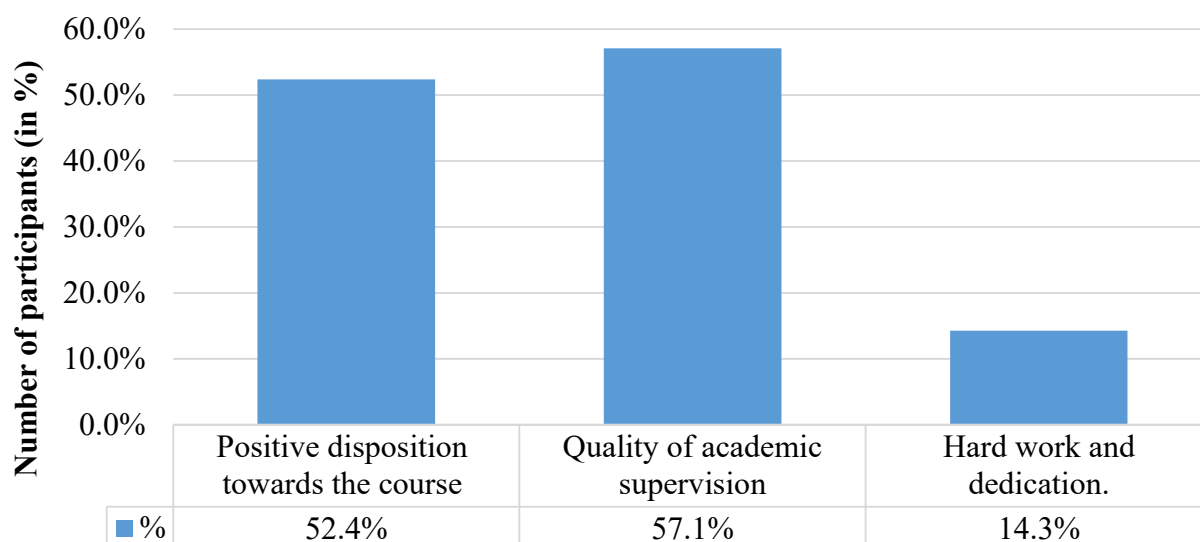


Figure 4.18: Main attributes for participants' successful learning in the MEdME

Figure 4.18 above firstly indicates that eleven (52.4%) of the participants (P4, P6, P10, P11, P12, P13, P14, P15, P18, P19 and P21) believe that their learning is mainly attributed to their positive disposition towards the MEdME course and their willingness to learn. P6, for instance, explained, *“My ability to adjust to any situation, enabled me to adapt and cope with the financial and emotional stress involved while studying”*. P4 also offered a clear articulation of a positive disposition as she explained, *“my willingness to participate in the debates during the course allowed me to develop my evaluation skills which I am currently using to perform my duties where I am”*.

Secondly, Figure 4.18 indicates that three (14.3%) of the participants (P4, P12 and P18) attributed their successful learning to their dedication and hard work during their time doing the MEdME programme. P18 explained, *“...I prioritised hard work and meeting deadlines. ...I made sure I have time for my studies, every day”*.

Thirdly, the bar chart shows that twelve (57.1%) of the participants (P1, P3, P5, P7, P9, P11, P15, P16, P17, P18, P20 and P21) all cited the quality of academic supervision from the RU staff members as the most significant aspect which both encouraged and enabled them to learn during the MEdME programme. P3 explained, *“...I had a good research supervisor who guided and supported ... me understand mathematics education better”*. P9 in acknowledgement of the great supervision cited that her supervisor made sure that *“students read more ...and they are just there as facilitators, this method helped me to love reading”*.

The love for reading was also cited by P1, P5, P15 and P20, stating that the more one reads the more they develop the love for reading.

4.5.4. What more did the participants need to learn in order to enhance their critical reflexivity?

This question sought the participants' views on whether there were factors other than the MEdME that contributed towards their critical reflexivity, and what the programme should perhaps consider in its future offerings. Some participants believed the programme is not lacking in any aspect, while others thought the programme is lacking in two aspects: (1) in mathematics content and pedagogical knowledge, and (2) in journal writing.

Ten participants (P1, P2, P3, P5, P6, P7, P10, P12, P15 and P20) stated that the programme is not lacking in any aspect. Eight of these participants (P1, P2, P3, P5, P6, P7, P10 and P12) are from the half thesis cohorts and the remaining two participants (P15 and P20) are from the full thesis cohorts.

The participants who are satisfied with the programme, mentioned that the course lacked nothing. P10 explained, *"It was coursework + thesis, I do not think the programme lacked in any way"*. P3 also explained, *"...The MEdME programme I went through is suitable for studying all aspects of mathematics education in Namibia"*.

However, eleven participants (P4, P8, P9, P11, P13, P14, P16, P17, P18, P19 and P21) felt that the MEdME programme lacks mathematics content knowledge and in journal writing. This group includes four participants from the half thesis cohorts and seven from the full thesis cohorts. P9 explained, *"Out of ten, I would rate nine on the MEdME programme. However, the '1' will be that the university must teach students to be good in writing journal articles or how to become a good author"*. Furthermore, P9 in conformity with P8, P11, P13 and P16, wants to see the university allowing students to publish at least one article in a credible journal before they graduate so that after graduation they would know how to write and publish. Currently these participants observed that some graduates still have no idea of how to go about publishing an article in a journal, even after graduating.

Mathematics content knowledge was further identified as lacking in the programme's offering by nine participants (P4, P8, P11, P13, P14, P16, P17, P18 and P19). P16 for instance explained, *"...As much as we need the theory and methodology part of teaching mathematics, we need the content part too"*.

As can be seen in the discussion above, six of the nine participants who cited the lack of mathematics content in the programme's offering are from the full thesis cohorts whose course did not include mathematics content in its curriculum, or any coursework for that matter. The other three participants are from the half thesis cohorts whose course included course work but who, in spite of this, still thought the content of the course work was not sufficient.

Figure 4.19 below shows a general comparison of the participants who are fully satisfied and those who identified some weaknesses and were thus not fully satisfied with the MEdME programme. Figure 4.20 shows a similar comparison but further compares the participants from the full thesis cohorts against those from the half thesis cohorts.

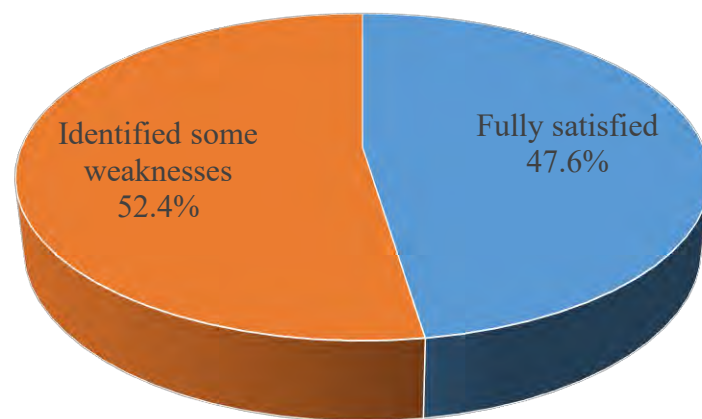


Figure 4.19: Participants' general satisfaction in the MEdME programme

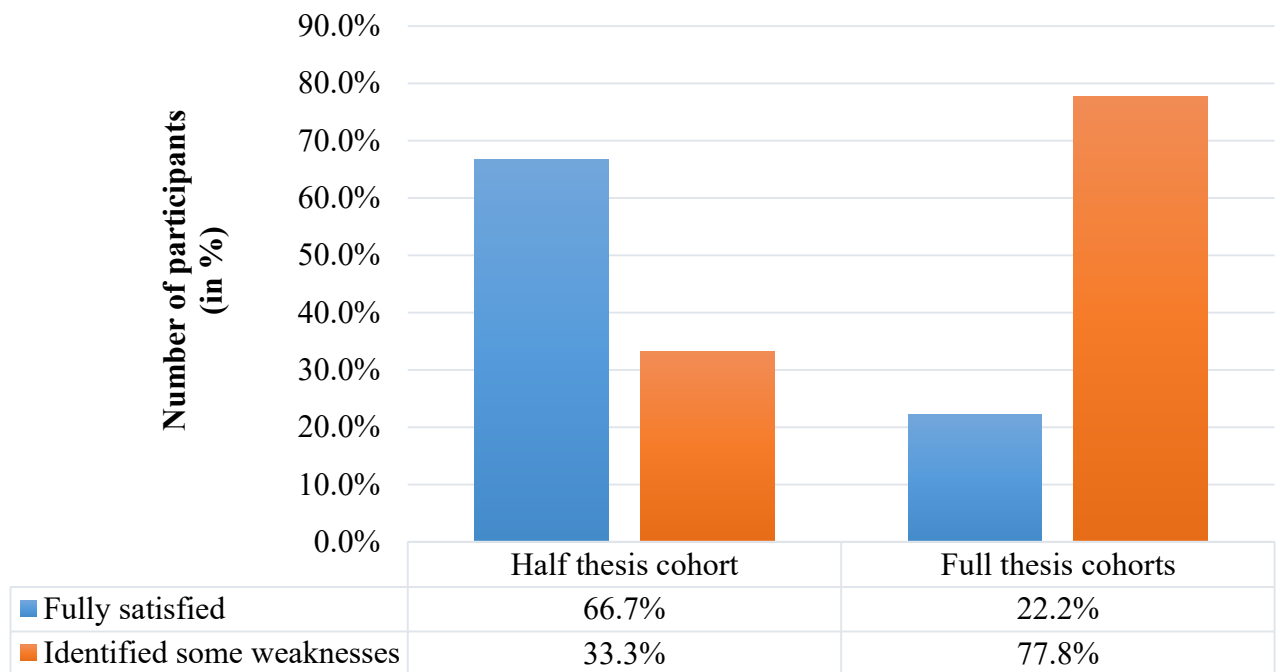


Figure 4.20: Cohort-based participants' satisfaction of the MEdME content

4.6. PART V: RESEARCH CAPACITY

4.6.1. Introduction

In this part there was only one question which asked participants to discuss if and how the MEdME programme enhanced their research capacity. All the participants agreed that the programme influenced their research capacity positively and they all described one or more aspects of how the programme influenced their research capacity.

4.6.2. Aspect of research capacity influenced by the MEdME Programme

There were five aspects which emerged from the participants' responses, namely: confidence in doing research, discovering the importance of doing research, improving academic writing, fostering curiosity to do research, and becoming authors. Figure 4.21 below illustrates the number of participants who commented on each aspect. This is followed by a detailed discussion of each aspect.

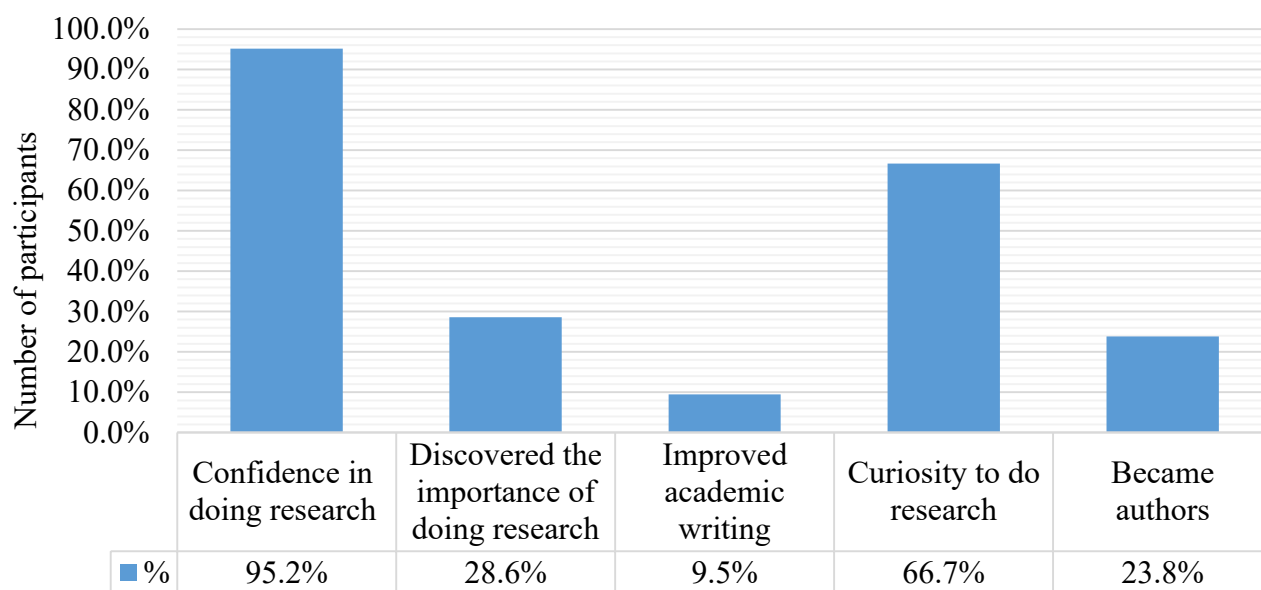


Figure 4.21: Aspect of research capacity influenced by the MEdME programme

As illustrated on Figure 4.21 above, 20 (95.2%) of the participants are more confident to do research now than before. This includes all participants except P8, who did not say nor imply any boost in confidence regarding carrying out research. P16 explained, “...*There is a deeper love and confidence for research that has grown deeper roots in me...*”

Some participants acknowledged that the MEdME programme equipped them with confidence and research skills which they now use in their professional spaces. P6 explained, “*My job requires a lot of mini researches in order to address the Mathematics teachers’ professional needs*”. It therefore seems that the MEdME programme was greatly instrumental in enhancing the participants’ confidence to do research.

Six (28.6%) of the participants (P1, P12, P14, P15, P18 and P21) indicated that the MEdME programme has enabled them to recognize the importance of doing research. P1 “... *realize that most of the challenges in mathematics education can be addressed through research...*” In support of these sentiments P14 appreciated that “...*there is always something new to learn from research projects*”.

Two (9.5%) of the participants (P14 and P18) mentioned that their academic writing improved significantly as a result of their inherent participation in the MEdME programme. This is relevant as a component of research capacity, considering that better academic writing is a prerequisite in research. P14 “...*learnt how to write a proper academic research with*

appropriate academic language”, while P16 can now “...present a critical interpretation and logically integrate arguments in any piece of writing”.

Interestingly, 14 (66.7%) of the participants (P1, P2, P3, P7, P8, P9, P10, P11, P14, P16, P17, P18, P20 and P21) all indicated that the MEdME programme prompted their curiosity to do more research. This is the reason why P1, P3, P7, P8, P10, P11, P16 and P18 all decided to enrol for a PhD programme – so that they can engage in more research.

Finally, five (23.8%) of the participants’ (P1, P10, P13, P18 and P21) research skills were enhanced and they have now become authors. P13 “co-authored with other scholars on issues such as perspectives of mathematics teachers on LCE policy and algebra turn-around teaching approach for grades 1-9 learners”. P10 and P18 alleged that they published articles in an accredited academic journal. P18 explained, “I have been pursuing opportunities that would locate my writing in the context of international literature and so far I have managed to author and publish two academic articles in SAARMSTE”. P1 did not reveal where she published her articles.

4.7. CONCLUSION

This chapter presented the analysis, findings and discussions of the data obtained in Phase II of my study (the survey questionnaire from the MEdME graduates). The findings were presented in five key sections according to the sections in the questionnaire. Section 4.2 presented the data about the contextual information about the participants. Section 4.3 presented the analysis of data pertaining to the graduates’ career trajectories. Section 4.4 presented the analysis of data concerning METN, while Section 4.5 dealt with data concerning graduates’ reflexive practices. The final Section 4.6 presented the analysis of data concerning graduates’ research capacity.

CHAPTER 5

ANALYSIS, FINDINGS AND DISCUSSION OF INTERVIEWS WITH GRADUATES

5.1 INTRODUCTION

This chapter presents the analysis, findings and discussions of the data obtained in the first section of Phase III of my study, that entailed two different types of interviews. The first interview was conducted with selected MEdME graduates, aiming at following up on the questionnaire to elicit deeper information about the outcomes of the MEdME. The second type of interview was with the RU staff members and the analysis of these is discussed in Chapter 6 of this study.

This chapter therefore presents the analysis of the data from the interviews with graduates. The interview consisted of five parts, thus the findings are presented in five key sections: 5.2. Part I: Background information; 5.3. Part II: Career trajectory (CT); 5.4. Part III: Mathematics education transformation in Namibia (METN); 5.5. Part IV: Reflexive practices (RP); and 5.6. Part V: Research capacity (RC). The data from the interviews provided in-depth perspectives of the participating graduates on the outcomes of the MEdME programme with regard to graduates' RP, CT, RC and METN, to supplement, clarify and/or extend on the data provided in the questionnaires as discussed in Chapter 4.

5.2 PART I: BACKGROUND INFORMATION

There were three main questions in this section. The first question aimed to capture participants' background information. The second question asked what motivated graduates to enrol for the MEdME programme and how significant the participants believed it was for them to possess a Master's degree then. The third question asked the graduates to assess the validity of a criticism that emerged from the questionnaire analysis in Chapter 4, that the MEdME does not equip graduates with mathematics content knowledge.

The responses of the participants to the first question are summarised in Table 5.1 below.

Table 5.1: The particulars of the participating graduates.

Participant	Registered	Submitted	Graduated	Current position held
PR1	2007	2008	2009	Lecturer
PR2	2007	2008	2009	Manager: TVET Standards
PR3	2014	2016	2017	School principal
PR4	2015	2016	2017	Instructor
PR5	2015	2016	2017	Lecturer
PR6	2017	2018	2019	Teacher

The data in Table 5.1 pertains to the six participants that were selected for the interviews (see criteria for selection in Chapter 3). Two of the participants (PR1 and PR2) are from the first cohort (2007-2008). PR3, PR4 and PR6 are from the fifth cohort (2015-2016) but PR4 registered in 2014 and only graduated together with PR3 and PR6 in 2017. PR5 is from the 2017-2018 cohort. It is also indicated in the table that PR1 and PR5 are lecturers at local universities. PR2 and PR4 are working in TVET departments where PR2 is a manager, while PR4 is an instructor at a vocational training centre. PR3 and PR6 are in the Basic Education Department where PR3 is a school principal and PR6 is a mathematics teacher.

It is evident from the table above that the selection of interview participants was quite wide which makes this sample of interviewees quasi representative of the common positions that one can occupy after obtaining an MEdME degree. It can therefore be argued that the data shared by these participants are likely to be similar to those of the graduates who did not participate in the interviews, because the participants in the interview are either from the same cohort or hold the same or similar positions as those graduates who did not participate in the interview.

5.2.1 Motivation to enrol and significance to possess a MEdME degree

The questionnaire analysis in Chapter 4 indicated that one of the most commonly cited motivations to enrol for a MEdME is the significance of possessing a Master's degree. In question 2 of Part I of the interview, I probed further on two main aspects. Firstly, what motivated the participant to enrol for the MEdME; and secondly how significant was it for them to possess a Master's degree?

All of the six participating interviewees responded to this question. On what motivated them to enrol, three main aspects were described, namely the quality of education at RU, professional development and career advancement purposes.

5.2.1.1 *Quality of education at Rhodes University*

PR1, PR2 and PR6 all enrolled for the MEdME because of the quality of education offered at RU. PR6 narrated that he *“came to know RU many years before I applied... Those who studied there speak highly of the quality of the institution”*. PR1 *“...considered the quality of their BEd programme ...the interaction that we had with our lecturers, we were free to criticize them, they were also free to criticize us, and they were free to criticize each other, correct each other without offending one another”*. PR2, on a similar note, added that the graduates of Rhodes University are people who do not need any introduction because their reasoning abilities speak for themselves.

5.2.1.2 *Professional development*

All the participants in the interviews cited professional development (PD) as one of their motivations to enrol. In this study I adopted the definition of PD from Mitchell (2013) who defines it as *“the process whereby an individual acquires or enhances the skills, knowledge and/or attitudes for improved practice”* (p. 390). PD is necessitated by the fact that even if a worker currently has the necessary qualifications and skills, he/she may need additional skills in the future. The graduates of the MEdME, for instance, all had a BEdHons and/or other qualifications but they nevertheless enrolled for the MEdME programme anticipating further efficiency professionally.

As a newly appointed education officer by then, PR2 felt that he needed some new skills to perform his job effectively because *“as an education officer you are coordinating the activities of mathematics for the entire country, so whatever impact you make would affect the country”*. PR2 explained that for one to serve as an education officer it was significant *“to be at a Master’s level because when you undergone a Master’s programme, it enhances your reasoning skills, ability to research, and betters your analytical skills...”*

As a mathematics teacher with fourteen years of teaching experience at that time, PR6 believed that *“adding a Master’s degree on top of that experience was significant into my professional development”*. Similar sentiments were also shared by the other four interviewees with a shared motive of enhancing themselves professionally.

5.2.1.3 Career Advancement

Career advancement is defined by (Oriol, Brannagan, Ferguson, & Pearce, 2015) as the act of moving “forward, ...or remain static” in one’s career (p. 1). This includes the ability to climb up the management ladder, to specialize in a particular field, or to move to a different professional field. In the interviews, PR4, PR5 and PR6 indicated that they enrolled knowing that a Master’s degree, particularly from RU could help them get career advancement.

PR5 “*knew one needs a Master’s degree in order to move from higher school teaching to lecturing*”. Fortunately, for PR4 and PR5, as soon as they obtained their MEdME degree, PR4 became an instructor, while PR5 became a lecturer. The two participants therefore considered possessing a Master’s degree to be significant if one wants a promotion to teach in tertiary institutions. PR6 does not have any science subjects in his qualifications and most of the promotional positions require candidates who specialise in mathematics and science. PR6 is therefore pursuing a PhD in mathematics education in order to increase his chances of securing a career advancement.

In summary, the interviewee indicated that the MEdME degree was significant to them for one or both of the following reasons:

- It was needed to provide the skills needed to effectively perform the job in the position in which some participants were serving.
- It was a requirement for career advancement

5.2.2 How valid is the criticism that the MEdME does not equip graduates with mathematics content knowledge?

The questionnaire analysis in Chapter 4 found that some respondents felt that the MEdME programme did not enhance their mathematics content knowledge as they expected. In the interview, I asked the participants if they thought this was a valid criticism of the MEdME programme.

Three of the interviewees (PR3, PR4 and PR6) thought it was a fair criticism. PR6 narrated that the programme “*...is not considerate whether you are from primary phase or secondary phase you will all find yourself in the same class. ...As we speak, in three to four years I will have a title of a PhD by name, but I know when it comes to Calculus system I have absolutely no idea. I seriously feel like something important is missing. There are aspects in the current maths*

curriculum one cannot teach at the senior level even if they have a MEdME degree because there was no exposure to such content”.

PR1, PR2 and PR5 thought the criticism was unfair. PR2 and PR5 believe that some graduates enrolled for the programme without knowing its rationale. PR5 explained, *“The qualification is a Master’s in mathematics education, not a Master’s in Mathematics. Master’s in mathematics education is about the theory of teaching mathematics, not the content to be taught”.*

5.3 PART II: CAREER TRAJECTORIES

In this part of the interview, there were two main questions. The first question had three sub-questions which asked the graduates to: (1) describe how their career trajectory evolved (or did not evolve) before and after obtaining the MEdME; (2) discuss as to what they attribute the progress (or lack of it) in their career; and (3) how they think the MEdME degree would influence their career trajectory in future. The second question asked the graduates how the MEdME has influenced the way they perform their job, if at all.

5.3.1 The participants’ career trajectories before and after obtaining the MEdME degree

PR1, PR4 and PR5 all believe that the MEdME programme was the greatest enabler of the progress in their careers. Their respective career trajectories are as follows:

PR1 started as a teacher and taught for over 10 years. She longed for a promotion but did not get one. She therefore decided to enrol for an MEdME at RU simply to try open up some more doors in her career. While she was pursuing her MEdME degree she *“applied for the position of a lecturer and I attached my MEdME first year results and maybe that convinced them to invite me for an interview”*. PR1 was then appointed as a lecturer, later as a teaching practice coordinator and has served on the campus management team since then to date.

PR4 and PR5 were both ordinary teachers before they obtained their MEdME degree and they were appointed as an instructor and a lecturer after obtaining their MEdME. PR5 explained, *“...I acquired knowledge from my intervention-based research, and that made me stand out during the interview because I had this new knowledge that nobody else could bring forth into the students”*.

PR2 and PR3 attribute their career advancement to their hard work. PR3 advanced from being a mathematics teacher to being an HOD and eventually a school principal. PR2 started as a

mathematics teacher in 2000. In 2002, he was promoted to HOD and was further appointed a facilitator for mathematics in the region. While serving as an HOD he attended three interviews in succession, (two for school principal posts and one for an education officer post) and was the successful candidate in all. He explained, *“I turned down the principal’s offers ...and chose the offer for the education officer for mathematics at NIED”*. He further moved into the TVET department and became an instructor for mathematics at a local VTC before finally moving into management at the National Training Authority (NTA).

The remaining participant is PR6 who had been a teacher for over 13 years before enrolling for the MEdME and continued to be a teacher after obtaining the MEdME degree. When I asked him if remaining a teacher is by choice he explained, *“...I used to apply for promotional posts but I never get shortlisted. This is because I am only specializing in mathematics and most of the promotional post require maths and science. I do not apply any more, I feel like I am just wasting my time”*. As discussed in the analysis for Part I, PR6 is now registered for a PhD in order to open up more opportunities for career advancement.

In summary, five of the six respondents in the interviews have experienced career advancement thus far. PR1, PR2 and PR3 have experienced such advancement both before and after obtaining the MEdME degree while PR4 and PR5 only advanced after obtaining their MEdME degree. PR1, PR4 and PR5 attributed their career advancement mainly to the MEdME degree while PR2 and PR3 attributed their career advancement mainly to their hard work. PR6 was the only interviewee who did not experience advancement in his career.

5.3.2 The influence of the MEdME programme on graduates’ professional lives

In question 2 of Part II of my interviews with the graduates I asked the participants to discuss the specific aspects they learned from the MEdME programme that made them more efficient professionals. There were seven aspects identified: being critical about issues, perseverance, time management, analytical skills, reflective practices, and development of confidence in mathematics education. These aspects are similar to the ones discussed by the participants in the questionnaire, as discussed in Chapter 4.

The first and most cited aspect was *being critical about issues*. As discussed in Chapter 2 of my study, the word critical means “to act carefully about a subject or idea” (McIntosh, 2013). All interviewees mentioned that the MEdME programme instilled in them a sense of being critical about everything they do in life, particularly in the performance of their jobs. PR3 was

more eloquent as he stated, “...research gave me the opportunity to ...learn how to critique and ...also to explore and understand things and ...people better”.

PR1 and PR6 identified *perseverance* as another aspect they learned from the programme. They narrated that the pressure they experienced during the programme taught them to stand the pressure in their jobs now. PR1 explained, “...I learnt to persevere just like I did while doing my master because it was also not easy”.

In my view, perseverance has a critical link with *time management*; one needs both of these qualities to succeed within a set period. In the interview, PR1, PR3, PR4 and PR6 all mentioned that the pressure they experienced during the programme taught them to manage their time better. PR6 stressed, “...One thing that delays progress in academic work is procrastination; I learnt to put up a timetable and strictly adhere to it”.

PR2 and PR3 cited *analytical skills* as another aspect they learnt from the programme that is crucial in the performance of their job. According to PR3, analytical skills are skills every manager must possess stating that while some school principals for instance “...struggle even to come up with their schools’ statistics of results, ...research has taught me how to analyse data so that it makes sense to everyone”.

PR4 identified *reflective practices* as one of the significant aspects she learned from the MEdME programme emphasizing that, “...successful teaching requires reflecting on what we teach”.

Finally, was enthusiastic about how the MEdME programme strengthened his confidence in the teaching of mathematics because he “developed maths content in my intervention research and I became an expert in the content that I developed”.

In summary it can be argued that the MEdME programme had a positive influence on how the participating graduates perform their jobs. This is because, as discussed above, some graduates became critical thinkers because of the programme. Some learnt how to persevere while managing their time effectively. Other participants gained analytical and reflective skills that are essential in the performance of their jobs. The programme has also developed confidence in some graduates in the teaching of mathematics.

5.4 PART III: MATHEMATICS EDUCATION TRANSFORMATION IN NAMIBIA

In Chapter 2 of my study, I discussed that the overarching objective of the MEdME is to develop critically reflexive practitioners who can influence the transformation of mathematics education in Namibia (Schäfer et al., 2014). Part III of the interviews sought the participants' views on how (if at all) the MEdME has influenced the mathematics education transformation in Namibia (METN). There were five questions in this section, which asked the participants:

- To describe the METN they observed after they obtained their MEdME degree,
- to discuss how (if at all), they contributed to the METN, particularly those who described the METN in question 1,
- to discuss whether there is still a need for further METN,
- what they think should be done to enhance the usefulness of the MEdME theses towards METN, and
- their views on whether the MEdME programme has contributed at all to METN.

5.4.1 The METN observed by the graduates

I asked the participants to describe any transformation that they observed in mathematics education after obtaining their MEdME degrees. They all responded to this question and I classified the identified transformations into three main areas of transformation, namely: (1) curriculum, (2) teacher education and (3) teaching approaches.

PR2, PR4 and PR6 observed that there has been a transformation in the mathematics curriculum in Namibia. PR6 explained, “...*There is an advancement in the maths content in the reviewed curriculum ... I believe this year we will see the result of this curriculum because this is the first year that this curriculum will be tested at the national level in terms of Grade 11 examination*”. For PR2, the most noticeable aspect is that mathematics is now compulsory to all the learners as cited in the current National Curriculum for Basic Education (NCBE) that “... mathematics is compulsory up to Grade 11” (Namibia. MEAC, 2010, p. 48).

PR4 observed an improvement in the use of visualisations in the mathematics textbooks. While doing her MEdME thesis, PR4 “...*went through the newly developed textbook. I can say there are more visuals used in the modern maths textbooks, and ...they are now more localised and self-explanatory*”.

PR1 and PR5 both observed transformation in *teacher education*. This makes sense because PR1 and PR5 are both teacher educators at local universities. Both of these participants stated that the content of the teacher education curriculum now leans heavily on subject content knowledge. PR1 explained, “*The student we are preparing ...now are getting more content, and ...less of methodology, unlike the previous curriculum, the one for the colleges, that was stronger on methodology and somehow neglected the content part*”.

The third area of transformation identified relates to teaching approaches particularly: (1) the transformation from teacher-centred approaches (TCA) to learner-centred approaches (LCA) and (2) the appropriate use of visualisations and ICT in mathematics teaching.

Mathematics education in Namibia is underpinned by the social constructivism theory hence it recognises the uniqueness of every learner as an individual and adheres to the philosophy of learner-centred education (MoE, 2008). However, according to the Ministry of Education (MoE), (2003) “much of the research on education ...reveal that the discourse of learning has not changed widely, although some teachers are changing noticeably” (p. 27). This concern is consistent with the findings of research done by PR1 and PR5.

In her MEdME thesis, PR1 found that “*...despite the implementation of the learner-centred policy in Namibia, teachers still believe ...that they are the only one who have to speak more and the learners have to listen...*” Similarly, PR5 found that “*...while the Ministry of Education have chosen learner-centred education, teachers still have no idea what is a learner-centred policy and how it should be implemented*”. Therefore, in terms of the teaching approach, there seems to be a resistance to transformation towards LCA. Whatever is causing teachers to revert to these old ways of teaching remains open for further research.

Concerning the appropriate use of visualisations and ICT in teaching, the mathematics subject policy guide recommends that “teachers should use these (visuals and ICT tools) to enhance learning and make teaching fun” (MoE, 2008, p. 6). In their interviews, PR3, PR4, PR5 and PR6 all indicated that there is a transformation in the use of visualisation including ICT in mathematics lessons. PR5, who is a teacher educator, narrated that their student teachers are more comfortable with technology and many of their graduates are using technology and other visuals “*more often and with confidence when they finally become teachers*”.

In summary, participants observed that the curriculum was reviewed to make mathematics compulsory to every learner and make the subject content more advanced. There is also improved use of visuals in the mathematics textbooks. It was also observed that the current

teacher training in Namibia equips students with more subject content than pedagogic knowledge. Could this be the reason why some participants observed that there is a resistance to change from TCA to LCA? On a positive note however, there seems to be improvement in the use of ICT and visualisation in mathematics classrooms.

5.4.2 How did the participating graduates contribute to the METN?

In this question, I asked the participants to describe how, if at all, they contributed to the METN particularly after obtaining their MEdME degrees. The participants believe that they contributed to METN through: teacher training, their teaching practices, curriculum development, publications and some, through assessment.

5.4.2.1 Through teacher training

PR1, PR3, PR4, PR5 and PR6 all indicated that they contributed to the transformation by training teachers. PR1 and PR5 are teacher educators and they obviously have a direct influence on the training of future teachers. PR1 further established a club on campus where teachers are trained on how to teach fractions using different strategies. She observed *“an improvement in the way my participants understand the concept of fractions...”* PR5 described a similar project that he is running in their town which *“...connects the primary teachers for professional development ...and the teachers are very positive about it”*.

PR1, PR3 and PR6 all claimed to have contributed through presentations in workshops and mathematics congresses. PR1 was identified by the regional mathematics education officer as a *“...focal person to give training to teachers on fractions”*.

PR3, PR4 and PR5 have been involved in presenting at the mathematics congress. PR3 explained that he *“...presents at a maths conference ...those who attend can tap in from my knowledge. Some of them we kept on communicating, asking for assistance here and there ...”*

5.4.2.2 Through own teaching practices

PR1, PR3, PR4, PR5 and PR6 are all involved in teaching at their workplaces, hence they believe that they have contributed to the METN through their own teaching practices. As a lecturer, PR5 believes that his *“...teaching approach prioritises student reasoning and thinking at the expense of doing absurd mathematics. They should understand not only what they are teaching but also why they should teach it”*.

5.4.2.3 Through curriculum development

PR2 believes that he has contributed significantly to METN through his MEdME research. He was an education officer when he enrolled for the MEdME. As an education officer, PR2 was a member of the curriculum panel, a body responsible for reviewing the mathematics curriculum in Namibia. In his MEdME thesis, PR2 found that *“many lower primary teachers were people who use to run away from mathematics as learners and at college they also opted*

for lower primary which had no mathematics. However, lower primary teachers are expected to teach all subject[s]t including mathematic that the person ran away from initially. ...That is why many Grade 1 – 4 learners have a negative attitude towards mathematics”. PR2 therefore recommended, *“Mathematics should be compulsory for all Grade 1-12 learners”.* Currently, as stated earlier, mathematics is compulsory to all Grade 1-11 learners, hence PR2 spoke strongly about his contribution to this transformation.

5.4.2.4 Through publications

PR1, PR4, PR5 and PR6 all indicated that they have contributed to the METN through published items. PR1, PR4 and PR6 have written papers focusing on the use of visual representation in the teaching of mathematics. Some papers were presented at mathematics workshops and congresses and some are in the public domain. PR4, for instance, explained *“... apart from the paper that I have presented at congresses and workshops, I have another paper out there and teachers can access and read it for free and be inspired to change to use more visualisation in their teaching of mathematics”.*

5.4.2.5 Through assessment

PR2 and PR6 stated that they have been involved in the setting, moderation and marking of national examinations at both Grade 10 and Grade 12 level. PR2 explained, *“...I was always part of that process when I was an education officer”* while PR6 has also been involved in marking *“the national examination for many years”.*

In summary, the participants identified five different ways in which they believe they contributed to the METN. Those include: training of teachers, their own teaching practices, the curriculum structure, published and presented papers and lastly through their involvement in the Grade 10 and/or Grade 12 national examinations.

5.4.3 Is there a need for further transformation in mathematics education in Namibia?

In this question, I asked the participants if they thought there is still a need for further transformation in mathematics education in Namibia. PR1, PR3, PR4, PR5 and PR6 identified some aspects that they believe need more transformation. I summarised the participants’ responses into three main aspects:

- Continuous professional development (CPD);
- teacher collaboration; and

- curriculum advancement.

5.4.3.1 The need for continuous professional development

In this study I adapt the definition of CPD from Mitchell (2013) as “the process whereby an individual acquires or enhances the skills, knowledge and/or attitudes for improved practice” (p. 390). PR1, PR3, PR5 and PR6 all highlighted that there seem to be many mathematics teachers in the system who need further training in areas such as the content of the reviewed curriculum, the implementation of the learner-centred policy and the appropriate use of visualisation in mathematics education. PR1 explained that the curriculum review was a step in the right direction and what is needed now is “...*the training of teachers since it has been observed that many teachers cannot cope with the content of the new curriculum*”.

5.4.3.2 The need for teacher collaboration

Currently, in Namibia, workshops for teachers are not often conducted. PR3 and PR4 felt that after the recent curriculum review, mathematics teachers needed intense training on the content and implementation of that curriculum. PR3 and PR4 are of the opinions that in the absence of workshops, teachers can collaborate through digital platforms for teachers, with the training being done through digital means. PR4 elaborated, “...*We have different social media platforms and ZOOM meeting where teachers can share knowledge. It can start with smaller groups*”.

5.4.3.3 The need for curriculum advancement

PR6 felt that the content of the mathematics curriculum in Namibia is less advanced compared to other countries in Africa and globally. He narrated, “...*I have a privilege of looking at the mathematics works of the kids in Zambia whenever I visit my family there and I’m currently in South Africa. The content and nature of mathematics they are doing is more advanced compared to ours in Namibia. The reviewed maths curriculum is moving in that direction, but on an international level the nature and the content of the curriculum itself is far below standard...*” PR6 therefore believes that there is still a need for transformation in the content of the mathematics curriculum in Namibia and this should be driven by research. He is however worried about how research in Namibia is done when the findings are not implemented.

5.4.4 How can we put the MEdME theses to better use?

In Chapter 4 of this study, over 85% of the graduates indicated that the MEdME theses produced in this programme are of great quality and have the potential to make a significant contribution to the METN. However, currently most of these theses are inaccessible to many

mathematics teachers in Namibia. In the interviews, I asked the participants how best the recommendations made in the MEdME theses can be considered so that they can possibly contribute to the METN.

The participants' views are summarised into three main recommendations:

- Research findings should be presented in mathematics workshops, congresses and papers;
- the university should disseminate the research findings; and
- there should be a research bank in Namibia.

5.4.4.1 Research findings should be presented in mathematics workshops, congresses and papers

PR1, PR3, PR4 and PR6 thought that the graduates need a platform to share their research findings. The platforms can be either mathematics workshops and congresses or short papers. PR1 observed that a lot of good research has been done in Namibia and since there is a poor culture of reading amongst teachers “...we could ...invite researchers to workshops and congresses to share and explain the findings of their studies”. PR4 suggested that the graduates should also write papers to present their research findings. She explained, “We can prepare short papers from our thesis and avail them to the fellow educators because if you give them the whole document they will not read it”.

5.4.4.2 The university should disseminate the research findings

PR2, PR3, PR4 and PR6 suggested that the best approach is for the university to prepare a summary of findings from the MEdME research and hand that summary to the MoE in Namibia for dissemination to the stakeholders. According to PR6, dissemination of research findings can also be at the regional level where, “...A once-off workshop can be organised where a document that synthesises everything can be compiled and be disseminated to different schools so that they can be coupled together with the curriculum as a supplement”.

5.4.4.3 There should be a research bank in Namibia

PR1, PR2 and PR5 all want Namibia to have a research database that PR5 referred to as a research bank. This idea emanates from the concern that many local researchers state that no similar study in Namibia can be found on a particular matter although similar studies have been done but are just not easily accessible. According to PR5, “...we can have a database for research done by Namibian scholars where every post graduate, who graduate by producing a research, should upload their thesis”.

In summary, all the participants in the interviews agree that even though the research done by the MEdME graduates are normally small case study projects, the findings and the recommendations in those research projects can contribute to METN. The participants also agree that there are no clear modalities in Namibia of how scholars can make their research work accessible to the public. Doing research and not sharing the knowledge produced in it means that students simply study to collect qualifications but the knowledge they produce remains undiscovered. The participants therefore made three main recommendations as discussed above, on how to make the knowledge produced from the MEdME research projects accessible.

5.4.5 Has the MEdME programme contributed to METN?

In Chapter 4 it was found that nearly 30% of the participants believed that the MEdME did not contribute significantly to METN as much as it is believed. In the interviews, I asked the graduates how valid they thought this criticism was.

PR1, PR2, PR3, PR5 and PR6 all disagreed with the criticism. They believed that the programme indeed played a significant role in METN. Their reasoning triangulates well with the findings discussed in Chapter 4, as they agreed that the MEdME graduates hold key positions and the knowledge they gained from the programme is filtering into the education system at national level. Some of the participants in the interviews are those who hold key positions, as shown in Table 5.1. PR6 explained, “...*The work of an education officer at NIED for example influences mathematics education in the whole country*”. The point here was that the number of graduates does not matter, but their role and position does. In justifying these utterances, PR5 explained, “*If it was not for Rhodes University, most of the Namibian teacher education institutions would not be having Namibians teaching there, even myself I wouldn’t be here training teachers*”.

PR4, however, does not agree that the MEdME programme has contributed significantly to METN. She had three reasons for her disagreement. Firstly, there are too few graduates to make an impact at a national level. Secondly, “*Most of the graduates only think about themselves and moving ahead in their career not necessarily about sharing and using the knowledge acquired from research with others*”. She gave an example of the many graduates who have produced wonderful theses but, “*as soon as they get a promotion they forget about the thesis and knowledge produced.*”

Thirdly, the knowledge gained from the MEdME programme is irrelevant in key positions held by many graduates. PR4 argued, “...As a deputy director for instance, there is nothing much you can use from the programme, it was meant for the classroom. It just help[s] you to get to the higher position... ”.

In conclusion, in Part III of the interview, the participants described a number of transformations in mathematics education in Namibia they observed after obtaining their MEdMEs and how they contributed to such transformations. The graduates further indicated that there is still a need for further METN and discussed their role in this process going forward. A number of suggestions were also discussed on how to make the knowledge produced in the MEdME theses accessible and possibly contribute to METN. Despite all the arguments, the shared belief of the majority of the participants is that the MEdME has indeed contributed significantly to METN.

5.5 PART IV: REFLEXIVE PRACTICES

In Chapter 2 of this study, a critical reflexive practitioner (CRP) was described as a person who is:

- self-introspective,
- willing to consider other people’s views, and
- is a researcher.

In Chapter 4, all the 21 participants indicated that the programme prepared them well enough to be CRPs, however, the reasons provided did not allow me to know the *mediating processes* leading to this claimed reflexivity. Mediating processes entail mainly the reasons why a programme does or does not achieve its objectives. In my study, for instance, how did doing research and writing a thesis enable the development of critical reflexivity in the graduates? In Part IV of the interviews, I asked the graduates three main questions pertaining to this issue:

- the specific aspects they learned from the MEdME which made them CRPs;
- how the MEdME programme taught them such aspects, considering that it was just a production of a thesis; and
- the main challenges they experienced during their studies in this programme.

5.5.1 What are the main aspects that made the graduates become CRPs?

The MEdME graduates have to submit a thesis before graduating, hence by virtue of that, they are all CRPs. My interrogation here was therefore about whether the participants also possess other characteristics of a CRP, namely self-introspection, and being open to others' views.

In the interviews, all the participants described aspects that are consistent with the element of *self-introspection*. The aspects described include academic freedom, and the ability to reflect. PR1 and PR5 both felt that the MEdME programme has academically liberated them. PR1 believes that her “...*thinking is not restricted by other people's views*” and to her “*that is academic freedom, because we have some of the educated people who ...are afraid of sharing their ideas*”.

PR1, PR2, PR4 and PR6 learned to do proper reflection through the MEdME programme. Reflection is an act of self-introspection because it requires one to examine oneself in relation to a particular event. PR1, for instance learn that “...*what I do is not always right. I need to think about it, weight it, and see where I need to make changes*”.

PR1, PR2, PR3, PR4 and PR6 all described aspects which are consistent with the element of being *open to others' views*. The aspects described include accepting criticism and being cooperative. PR1, PR4 and PR6 recognized their *abilities to accept criticism* from other people without being offended. PR1 explained, “*If you are educated and you can justify what you are saying, there should be no reason to ...be afraid of being criticised. If you are not being criticised you won't grow*”. The three participants all believe that after going through the MEdME programme, they are now more willing to consider other people's ideas.

Because of his openness to criticism and willingness to listen to other people's ideas, PR6 is now more *cooperative*. PR6 narrated, “...*I have lately come to accept delegated tasks. This is because I have come to understand that success comes as a team effort*...”

In summary, the analysis of participants' responses in the interviews indicated that the aspects learnt by the participants that enabled them to be CRPs were consistent with two characteristics of a CRP viz. self-introspection and the willingness to accept other people's views. It can therefore be argued that the MEdME programme has contributed to critical reflexivity of the graduates.

5.5.2 How did the programme teach the graduates what they claimed to have learnt, considering that it was simply a research project and a production of a thesis?

The participants were asked to clarify how the MEdME programme taught them such aspects they described in question 1 (5.5.1 above), considering that the programme was mainly just a research project and production of a thesis. The participants attribute their learning to two main aspects:

- quality academic supervision and
- extensive reading and writing of a thesis.

5.5.2.1 Quality academic supervision

All participants in the interviews believe that the academic supervision by RU staff members played a central role in enabling them to learn. PR5 narrated, “...*My supervisor was very innovative and had a philosophy like mine. He doesn’t believe in doing things traditionally but believes in doing things his own way and that really inspired my learning*”.

The quality supervision has also inspired the graduates to be critical thinkers and always work hard. PR6 explained, “*My supervisors always wanted the best for me no matter what kind of work it is, they will respond timely to you*”. PR6 further explained that knowing what his supervisor expected from him, he started being careful of every word he wrote, as he knew that he would be accountable for every word used. After two years of such practice, it became a habit to him, as he explains, “*I reflect on whatever I do and try to do it better next time*”.

The participants also indicated that through the quality academic supervision they learnt to accept criticism without being offended. Supervisors also instilled in the graduates a culture of cooperation, because after getting feedback from the supervisor one needs to cooperate with the supervisor and other students in order to make proper corrections to one’s work.

5.5.2.2 Extensive reading and writing of a thesis

Every education researcher does lots of reading and reviewing of existing literature. This helps a researcher to, inter alia, gain an understanding of the existing research and debates relevant to a particular area of study, to prevent duplication and to give credit to other researchers. The participating graduates in my interview indicated that reading could also contribute to the researcher’s academic freedom, ability to reflect and willingness to accept criticism and critical thinking among others. PR3 explained, “*During research you read a lot and each reading has its own views some of which may challenge your current believes*”. The point here is that by

reviewing a lot of literature the researcher can learn that there are other ideas different from theirs. The researcher can also get used to analysing ideas before making conclusions and develop a culture of doing this analysis in their everyday lives, which helps them become critical thinkers.

5.5.3 What were the main challenges experienced in studying towards the MEdME programme?

I included this question because the challenges experienced by the graduates during the programme are part of the *causal assumptions* of the PT as discussed in Chapter 2 of this study. The participants mentioned the following challenges: balancing time, financial problems, fear of failing, non-cooperative participants and other technical challenges.

Financial problems were cited by all six participants. They narrated how difficult it was to pay their MEdME programme's fees. PR6 was fortunate as he got a loan from Namibia Student Financial Assistance Fund (NSFAF) that enabled him to pay his fees. Other participants had to struggle on their own to pay the fees and PR1 expressed her appreciation of the university, stating *"Those people are very lenient. ...If you cannot pay the full amount you can pay in instalments"*.

Five of the participants experienced a challenge of **balancing time**. PR1, for instance, explained *"...I had issues meeting the due dates to submit the chapters"*. PR2 *"...could recall spending sleepless nights because during the day you have to deal with your professional duties"*. All the other participants shared how they struggled to fit their academic work into their everyday schedules except PR5 who did his MEdME degree full time.

In addition to the challenges discussed above, PR2 was also haunted by the **fear of failing**. He explained, *"...If you fail people will make fun of you and you will have wasted your money and other resources and even your family will hear that you have failed, it would be shameful"*.

PR1 and PR6 further shared how difficult it was **working with the teachers** who were their participants. PR16 narrated, *"...You know they feel like it is you who is going to benefit. ...It was very difficult for me just to convince the colleagues to be part of the study and I believe everyone who worked with teachers would testify to that"*. PR1 added that teachers are very busy people and when you try to fit your research in their schedule some feel like you are bringing pressure into their schedules.

In addition to financial problems, PR5 described four other *technical challenges* he faced. Firstly, he was “...*the only full time student in that course. ...It was a very painful thing because you are alone and you don’t have anyone to look at your work apart from your supervisor*”. Secondly, PR5 “*found it very difficult to understand how to research intervention ...it took me a while to even know how to analyse my data*”.

Lastly, PR5 had a problem finding literature for his topic. He explained, “...*A few years back I came to realise that there are so many people who did research on fractions in Namibia. If I could have found these people’s work by then it would had helped me to develop the context of my study*”.

In summary, the interviewees identified seven different challenges that they experienced when they were studying towards an MEdME degree. All the six participants experienced problems paying the programme’s fees; five participants cited balancing time and two found it hard to work with teachers. There were also four challenges mentioned by one participant each, viz. fear of failing, no critical friend, difficulty in understanding the research type, and finding appropriate literature.

5.6 PART V: RESEARCH CAPACITY

This last part of the interview consisted of only two questions. The first question emerged from the questionnaire analysis in Chapter 4 after over 20% of the participating graduates suggested that the programme should include a requirement that a student must publish a paper in a credible journal before they can graduate, so that after graduating they would know how to go about this exercise in their professional lives. The second question was an open platform for the participant to say anything else they would want to share about the programme.

5.6.1 How valid is the criticism that the MEdME programme does not prepare students well enough to continue publishing after graduating?

PR1, PR2 and PR6 all thought that the criticism was not valid. PR1 argued that the students are given opportunities to “*write articles, publish and attend conferences, to present their papers, but they are more focused on their studies and think writing articles is time consuming*”. PR6 also shared similar views and further indicated that the current setup of the MEdME programme is appropriate to grant a student a pass on the programme.

PR3, PR4 and PR5 on the other hand believed that this is a fair criticism for the MEdME programme. PR4 stated that even though they were given opportunities to publish and present

papers, not everyone took that chance because they were also given the option of choosing whether they should publish. She was concerned that some graduates go out of the programme not knowing how to publish a paper. PR3 explained, “*The idea is a good one because in the process students might develop more interest in researching and publishing*”.

5.6.2 Is there any other thing about the MEdME programme in Namibia that you would like to share with me?

I asked the participants to make their final comments with regard to the MEdME programme. Each participant had the freedom to share views of their choice that they thought were important but that had not been discussed at all (or enough) during the entire interview.

I grouped the responses into three groups. The first group comprises of PR4 and PR6 whose courses did not include coursework, thus they emphasized that the programme needs to equip graduates with mathematics content knowledge. PR4 reiterated, “*We all need content. They should bring back the course where people do content part and research part*”.

PR1, PR2, PR3, PR5 and PR6 all indicated that the MEdME programme is a good programme. PR1 explained, “...Even though I *paid for the studies the knowledge that I got will lasts forever, and I am a proud RU graduate*”. PR2 in addition wants RU to bring together its alumni. He explained, “*It would be an appropriate platform for exchanging ideas and ...taking stock of RU graduates in Namibia. Then you know where your people are and what value they are adding*”. PR3 and PR5 on the other hand recommended that RU should also recognise the value of the theses produced by its graduates by considering the findings and the recommendations made in such studies.

In summary, the analysis of part V of the interviews found that half of the participants believed that it would be fair if it becomes a requirement that each MEdME student publishes a paper in a credible journal before they graduate. This is because many MEdME graduates do not know how to go about publishing a paper in a journal. However, the other half of the participants see no need for this to be a requirement because publishing is only appropriate as a requirement at PhD level. These participants believe that publishing may put extra pressure on the students and prevent them from finishing the course within the prescribed two year period.

5.7 CONCLUSION

This chapter presented the analysis, findings and discussions of the data obtained from the interviews conducted with selected MEdME graduates. The findings were organized into five sections, numbered 5.2-5.6. The first section included background information on the participants. The participants' perspectives on their career trajectories were explored in the second section. The participants' perspectives on mathematics education transformation in Namibia were discussed in the third section, while the fourth section presented the perspectives on issues of reflexive practices, and the fifth section focused on issues of graduates' research capacity. As a result, the data from the interviews supplemented, clarified, and/or extended the data supplied in the questionnaires covered in Chapter 4 by providing in-depth views of the participating graduates on the outcomes of the MEdME programme.

CHAPTER 6

ANALYSIS, FINDINGS AND DISCUSSION OF INTERVIEWS WITH RHODES UNIVERSITY STAFF MEMBERS

6.1 INTRODUCTION

This chapter presents the analysis, findings and discussions of the data obtained in the second part of Phase III of my study. Phase III entailed two different types of interviews. The first type of interview was conducted with selected MEdME graduates as discussed in Chapter 5 above. The second type was conducted with the two RU academic staff members who have been core to the MEdME programme (hereafter ‘the programme’) since its inception (hereafter ‘staff members’). The aim of interviewing the staff members was to elicit data about the six elements of the PT for triangulation purposes and also to strengthen the validity of the findings discussed in both Chapters 4 and 5.

As discussed in Chapter 2 of my study, the *problem definition* is the description of the problem that the programme was meant to address and will be addressed under the first two questions listed above. *Implementation issues* are the activities that can help in solving the identified problems and how the problem solving process is executed. The *critical inputs* are all the physical, intellectual, human and financial resources needed for the successful implementation of the programme. The *mediating processes* include the reasons why a programme achieves or does not achieve its objectives. The *exogenous/contextual factors* are the factors which the staff members believe influenced the implementation of the programme. The *expected outputs* are the outcomes and possible impact of the programme.

This chapter therefore presents the analysis of the views of the two staff members (SR1 and SR2) who were the participants in this interview. Even though each interview consisted of five different parts, for a smooth narrative the analysis of the data is presented by addressing the following questions which are all based on the PT which underpins my study:

- What was the problem?
- How was it addressed?
- What were the critical inputs?
- Did RU have sufficient and appropriate of these critical inputs?
- What were the activities involved in the implementation of the programme?
- Were these the most appropriate activities for implementing this programme?

- Which objectives have been attained?
- What enabled or constrained the objectives being attained?
- What challenges were experienced in the implementation of this programme and how were they addressed?
- Are there issues about this programme that need improvement?

This chapter is going to incorporate the response to my fourth research question which is: “What has enabled or constrained the perceived impact of the MEdME from the lecturers’ perspectives?”

6.2 WHAT WAS THE PROBLEM?

As discussed in Chapter 2 of this study, RU continues to offer the MEdME in Namibia, although UNAM is also offering a similar programme in Namibia. While I anticipated learning the rationale of the MEdME programme from the staff members’ perspectives as highlighted earlier, I also wanted to understand why RU is still offering the MEdME programme in Namibia although UNAM is offering a similar programme in Namibia. In Chapter two, it was explained that several studies have found that there was still a shortage of skilled, experienced and trained human resources in all sectors of employment in Namibia, including the education sector (MoEAC, 2018). This was the main reason why RU came to offer a MEdME programme in Namibia. However, I wanted to know if there were other specific gaps that the MEdME programme was meant to address which the local universities are failing to address?

Four different problems were identified as gaps in knowledge within the Namibian mathematics education terrain. The gaps include:

- Local universities do not have sufficient capacity to meet the local demand of Master’s enrolment;
- RU offers a higher quality degree;
- there is still a lack of research capacity in mathematics education in Africa; and
- there is little research going on in Namibia.

These gaps are discussed in detail below.

6.2.1 Local universities have not sufficient capacity to meet local demands for Master's enrolment

Only SR1 made comments about this gap, indicating that the local universities are failing to meet the demand for the Namibian students' desire to enrol for Master's degrees in mathematics education. This is because the average number of Namibian applications RU gets *"...for this programme per cycle is over 60. This is a clear indication that the Namibian institutions are not able to fill the gap fully..."* SR1 further stated that even though *"...there has been new institutions that have come up recently [in Namibia], they have not enough capacity and the know-how to offer such Masters' programmes"*.

The University of Namibia is the only local university offering an MEd in mathematics education in Namibia, and thus far no study has been found which focuses on the capacity of UNAM to offer the MEd in Namibia. However, in their 2019 Faculty of Education prospectus, it was stated that offering of the MEd programmes are subject to the availability of qualified lecturing staff. It further stated that *"it remains the prerogative of the Faculty of Education to determine the number of MEd students that can be enrolled each year"* (University of Namibia (UNAM), 2019, p. 280). In my interpretation, this statement suggests that UNAM does not and cannot enrol all the qualified applicants for the MEd; they only admit a limited number. In the absence of research on this matter, therefore, this information is sufficient in my interpretation, to indicate that to some extent UNAM has only a limited capacity to offer the MEd in mathematics education in Namibia. Moreover, since UNAM is the only local university offering a MEd in Namibia, it would be improbable to expect a single university to have enough capacity to enrol all the MEd qualified applicants in the whole country. The involvement of RU in offering an MEd in Namibia therefore seems to supplement the efforts of UNAM in this regard.

6.2.2 RU offers a higher quality degree

There is a strong perception among the two interviewed staff members that RU offers a higher quality degree than those offered by the local universities. SR2 explained that *"RU focuses strongly on ensuring quality research, quality education and quality development"*. He further stated that RU does not normally market its programmes in Namibia but there are always a lot of applications –a clear indication that the *"graduates are happy with the quality of the programme..."* This perception triangulates well with the graduates' assertions as discussed in Chapter 4, where over 38% of the participants in the survey indicated that their motivation to enrol for the MEdME programme come from the alleged quality education at RU. This was the

second highest motivating factor listed by the graduates. The graduates indicated that RU has a good reputation of for higher quality education in Namibia society.

Moreover RU is ranked way above UNAM by all the university ranking websites I have viewed, including some of the most reputable rankings like the Academic Ranking of World Universities (ARWU), Times Higher Education (THE), and Quacquarelli Symonds (QS) (Bilton, 2018). These rankings consider features of the university, including the quality of education. Even though university ranking has been widely criticised, having one university ranked above the other by all the ranking bodies gives an impression that the former, to some extent surpasses the latter in terms of quality of education offered.

My interpretation of the discussion above is that RU has a reputation of quality which attracts students to apply for the MEdME. This quality was identified by students as their motivation to enrol for the MEdME, by the RU staff members who participated in my study, and it is also shown by the university rankings. Therefore even though no study has been found that evaluated and compared the quality of education at the two universities, it can be argued that RU offers higher quality education as alleged by the RU staff members who participated in my study.

6.2.3 There is a lack of research capacity in mathematics education in Africa

This third gap was described by SR1 who indicated that Africa “*fares very badly on an international scale and currently we do not have enough sense and understanding of exactly what is going on in our schools and how we should address it*”. He however believes that there is still hope as he “*fully abides by the mantra that African problems need to be solved by its own people. ...But to solve problems we need research, we need evidence, and we need a base on which to build out problem solving strategies*”.

6.2.4 There is little research going on in Namibia

The fourth gap was also described by SR1 that “*very little research is going on in Namibia generally*”. He thought that “*there is a huge need for Namibia to establish a more coherent, active and directed research agenda and research policy because there is a huge gap in dealing with data that originate in ...the schools of Namibia*”. In Chapter 1 it was discussed that RU started offering the MEdME programme because several studies found that there was still a shortage of skilled, experienced and trained human resources in all sectors of employment in Namibia, including the education sector (MoEAC, 2018). The shortage of skills and knowledge was also recognised in earlier national documents including *Vision 2030*, and National

Development Plans (*NDPs*) 1 and 2 where it was stated that if Namibia is to realise her vision of joining the rank of high-income countries, it needs to focus on human capacity development through research (Namibia. National Planning Commission (NPC), 2004). The point here is that the assertion of SR1, that little research is going on in Namibia is not a new discovery, it has been recognised in earlier national documents and can therefore be considered as a valid gap in knowledge in Namibia.

This gap also triangulates well with the concern shared by the MEdME graduates in Chapter 5, that during their studies the graduates found it difficult to get relevant literature from within Namibia because there is no coordinated way of sharing research findings in Namibia. In my search for evidence of this, I came to realise that even UNAM, which according to (Kgabi, 2011) is one of “the main institutions given the task of producing the future research community” seems not to keep record of all research done by its students (p. iii). This is because even though the university has a research repository, only 31 Master’s theses on mathematics education could be found there, with the latest upload being 2019. This seems to be a very small number to be the only Master’s theses produced at UNAM in their 13 years of offering this programme throughout the whole country. If this number is correct though, it only renders the gap identified in 6.2.1 above more relevant, because 31 Master’s theses in 13 years from the whole population of the country is a very small number. Furthermore, since UNAM has the mandate of producing the future research community, it needs to establish coherent, active and directed research agenda to recognise research done by Namibian scholars from other institutions. This would indicate how UNAM recognises the knowledge produced and the literature enrichment would certainly create a pool of knowledge for future researchers, teachers, scholars and other stakeholders nationally and globally. This is however not currently happening and I understand this is what SR1 has recognised, as stated above.

In summary, the staff members identified the four main gaps in mathematics education in Namibia as discussed above. In Chapter 2 a programme was defined as a “series of planned actions designed to solve some problem” and recognition was shared that, “if there is no problem, then there is no need for programmatic intervention” (David et al., 2010, p. 5). The Namibian government and RU recognised the gaps in knowledge as discussed above and RU raised its hand to acknowledge that their MEdME programme can address such gaps. In Section 6.3 below, I discuss how these gaps were addressed and why the staff members consider this programme as an appropriate tool to address the identified gaps.

6.3 HOW WERE THE IDENTIFIED GAPS ADDRESSED?

The RU staff members shared a perception that the MEdME programme was, and still is, one of the appropriate tools that can address the identified gaps discussed in 6.2 above. This section presents the discussion of the staff members' views about the relevance of the objectives of the MEdME programme in addressing the identified gaps. The specific objectives of the MEdME as discussed in Chapter 2 are:

1. Developing and growing critically reflexive practitioners.
2. Graduates that have grown in their own professions including their capacity to research.
3. Graduates that have the capacity to act as agents of change in the transformation process of mathematics education in Namibia.

The perception of the RU staff members was that by achieving these goals the identified gaps would be addressed.

6.3.1 The objectives of the MEdME (expected outputs)

The staff members identified three main aspects which they believe are the main objectives of the MEdME programme in Namibia and they believe these objectives align very well with the identified gaps. Firstly, is enhancing research capacity which was identified by both of the participants as the main objective of this programme. According to SR1 *“the overarching aim is to capacitate educators to become researcher”*. For this to happen SR1 believes that students *“need to be on top of the field, you need to have read widely, and be aware of the Namibian context within the southern Africa and the global context. You also need to be able to articulate research problems into research questions that will generate interesting narratives, interesting findings and interesting research designs”*. In addition, SR2 explained that capacitating the students with research skills is core in this programme. He emphasized, *“The Master’s to the real extent should really help the students to start engaging and researching in maths education at much deeper level”*.

I interpreted the assertions of the staff members above as a need to develop critical consumers of research, that is, knowledgeable professionals who can critically analyse and evaluate research as well as being able to use research to identify gaps and problems that need investigation; being able to design and undertake appropriate relevant research that helps to build mathematics education in Namibia and contribute to the literature in the field more broadly. The ability to critically analyse and evaluate research is one of the characteristics of a critical reflexive practitioner (CRPs) as discussed in 1.2.2.3 in Chapter 1 in this study. The

ability to develop CRPs suggests that the programme is offering high quality education and in that way addresses the second gap as discussed in 6.2.2 above.

The second objective of the MEdME programme described by the staff members is to contribute to the transformation of mathematics education in Namibia (METN). SR1 believes that *“transformation in maths education is needed all over the place and the only way to transform mathematics education ...is to first collect evidence ...and to understand the problem”*. SR1 also feels that identifying problems and finding solutions to identified problems in mathematics education is part of METN. This objective draws heavily on the first objective regarding developing CRPs discussed above. The developing and growing of CRPs has a direct link with being agents of change who can drive transformation. In my view CRPs are more likely to contribute to METN than the rest of the population. That being the case therefore, by achieving the first objective you are also in a way paving a way to achieve this second objective and of course addressing the second gap as discussed above.

The third objective of the MEdME programme according to the staff members is to contribute to the global deliberations on mathematics education. SR1 stressed that the MEdME programme also has an objective of *“...contributing to the transformation in mathematics education globally, so we try to be part of the global exchange and interchange of ideas and solutions*. SR2 added that the MEdME research projects are not as big but they are making a contribution, regardless of the magnitude.

My interpretation of the interchange and exchange of ideas and solutions as alluded to above is that this programme is involved in capacitating students to carry out research and produce new ideas and solutions to identify issues. By capacitating students with research skills, the programme produces graduates who have grown in their own professions and this can contribute to addressing the alleged lack of research capacity in mathematics education in Africa, the third gap identified by staff members. Capacitating the students with research skills can also contribute to addressing the issue of little research going on in Namibia, the fourth gap. However, I am cognisant of the possibility that there might be factors other than the lack of research capacity which are currently also contributing to the issue of the persistently little research happening in Namibia.

In the discussion above, the staff members indicated how the MEdME is tailor-made to address the identified gaps. Knowing that the programme is perceived to be the most appropriate tool that addresses the identified gaps is important, however the question of critical inputs may

arise, i.e. what resources are needed for the successful implementation of this programme, and does RU have the appropriate and sufficient resources for this implementation? In the next section I discuss the views of the staff members of how successful the programme was, in achieving its objectives.

6.3.2 Resources (critical inputs)

There are two questions addressed under this section: (1) What resources are needed for the successful implementation of the MEdME programme? (2) Does RU have sufficient and appropriate of such resources. The participants' responses are discussed below.

6.3.2.1 Resources needed in the implementation of the MEdME programme

Six different resources were identified as crucial in the implementation of this programme.

(i) Human resources

SR1 explained, *"You need human capacity, you need expertise and you need experience to run a Master's programme"*. Similarly, SR2 shared such sentiments but classified resources into two groups. The first group includes *"the people who are interested, who want to grow, and have that commitment ...from the Namibian side"*. The second group includes *"...the staffs who have the right qualifications, who are interested in maths education and can offer quality supervision and who have enough time in their timetables to come to Namibia"*.

(ii) Time

According to SR2 *"...people who are studying need to spend quality time in their academic work so that they produce quality research. Time is also an important resource to the staff members because without time they will not be able to produce quality supervision to the students"*. Literally, having people who are willing either to study or to supervise is important but they also need to have time for the studies.

(iii) Infrastructure

Infrastructure in this context includes the place where the students and their supervisors can meet, accommodation for both students and supervisors and also the libraries where students can access books and other reading materials. SR1 noted, *"Without infrastructure it would be very difficult to offer this programme as it requires face-face interaction from time to time"*. SR2 added, *"...The University has to ensure the availability of such space"*.

(iv) *Internet connectivity*

SR2 noted that “...internet and connectivity are increasingly becoming important too in enabling students to access the network to look for resources and access Rhodes library”. SR1 emphasized further that without internet connections the student would be required to either travel to the university to access some library materials or the materials will have to be sent by mail, which is both time consuming and expensive.

(v) *Finances*

Finance was identified as a critical resource because the availability of supervisors, infrastructures and internet would always require money. SR1 explained that universities “need capital to run any kind of research project because research is quite expensive”. SR2 added that “the university also needs funds to ensure effective supervision for students works”. According to SR1 the need for money will even be greater in future because RU wants to start “...running bigger research projects which are longitudinal and involve bigger areas and more schools”.

SR2 further noted that “Students have to travel to meet with their supervisors, they’ve got to register, and they need other study materials”. It is therefore evident from these narratives that funding is a fundamental resource in this programme.

(vi) *Political will*

This was described as a resource by SR1 who indicated that RU “needs the political will to engage in that kind of research”. This is not only important in allowing the university to offer a course and carry out research in the country but additionally because the university “also needs to disseminate the research to the critical people who can do something with its findings”. The critical people referred to here are policy makers and they are in the political realm.

In summary, the staff members identified six main resources they believe are critical for the successful implementation of the MEdME programme in Namibia, namely human resources, time, infrastructures, internet connection, finances and the political will. Below I discuss whether RU have these resources in appropriate quality and quantity.

6.3.2.2 Availability of resources at Rhodes University

The staff members were further asked if they thought RU has such resources in sufficient supply. Below I discuss the participants’ responses according to the resources that were identified.

(i) *Human resources*

As explained earlier, human resources were classified into two groups: (1) the students who are willing to do the programme and (2) the staff members who are able to offer the programme.

In terms of students, the university always receives huge numbers of applications from students who are willing to do the course. SR1 clarified further that the university can choose only the limited number of students that they can handle in one cohort.

Regarding staff members, SR1 explained, “*Rhodes [university] has the expertise although it is hard work. It is a huge commitment to expect lecturers to travel to Namibia five times a year and keep the programme on a sustained kind of trajectory*”. In support, SR2 further stated that “*the workload for the Namibian programme is normally allocated and balanced with the normal RU education department work load. We always have the right specialised staff*”.

According to their profiles, the two staff members seem to be experts in this programme. SR1 indicated that “*it is nearly 25 years that I have been lecturing maths education full time*”. He is “*the one who started that ...Master’s course which is now well into about 12 years of running*”. Throughout all those years, SR1 was always part of this programme. To date he has supervised over 30 graduates from this programme.

SR2 also commented that he “*...worked with [SR1] in this programme ...from the beginning which was round about 2005/2006*”. During his time in the programme SR2 “*have got about 12 master’s students ...who have graduated, then I also had supervised a PhD*”.

It can therefore be concluded that RU has appropriate human resources needed for the successful implementation of the MEdME programme.

(ii) *Time*

SR2 indicated that time is always a challenge because the students in this programme are all personnel in the Ministry of Education and they are busy people therefore “*it is a matter of knowing how to manage time*”. SR1 also felt that students have to make some sacrifices in order to make time for their studies, despite their tight schedules.

From RU’s standpoint SR2 explained, “*If you are working with the Master’s students from Namibia and Master’s students in South Africa, you spend the same time on each student*”. The staff members therefore felt that even though time is really a challenge to everyone, time is always available to those who create it in their schedules.

(iii) *Infrastructures*

SR1 explain that initially they were offering the programmes “*at Rossing foundation in Katutura in Windhoek ...but we outgrew that place because of ...the high demand and we decided to move to NIED in Okahandja*”. SR2 added that “*NIED is an education development institution and we are part of their planning so at the moment NIED is offering good space for us including affordable accommodation for students*”.

With regard to access to library, SR1 explained that initially “*...we did a lot of printings, we sent physical books by post and courier and that was quite difficult. Now of course connectivity has improved, access to journals and other resources has also improved so we no more have an issue there*”.

In a nutshell, the staff members believe that RU has sufficient infrastructure to offer the MEdME programme in Namibia.

(iv) *Internet connection*

This programme requires internet connection because students need to access the RU library online in order to search for readings and for the purposes of communication. According to SR2 “*the Namibian network system has been developing just like everywhere else. We have worked harder to put up our network at NIED. Now we can always have network at NIED when we meet*”. SR1 also agreed that internet connection has improved hugely in Namibia – which has made running a programme in Namibia more trouble-free – even communication with students is now easier. Briefly, RU has internet connectivity is sufficient to support offering the MEdME programme in Namibia.

(v) *Finances*

Money is another resource which this programme cannot do without. With regard to the students SR1 explained that “*...all our Master’s students conduct research in their own schools not only for convenience and purposeful reasons but also due to costs*”. SR1 further narrated that he is “*...in a research chair with access to generous funding on a regional level, so my Namibian students benefited from that grant. So the MEdME programme is quite well heeled financially*”.

SR2 explained the finances mainly from the university’s standpoint. He narrated that “*...all the money that comes in from the Namibian students is used to fund the implementation of the MEdME programme*”. He clarified that there is always a balance about keeping the fees as low

as possible and keep the quality as high as possible. If the university decides to increase the quality of the programme, the fees will also be likely to increase. Briefly, the two staff members believe that currently RU has sufficient finances to implement the MEdME programme successfully.

(vi) *Political will*

For the MEdME research findings to be considered for possible implementation, there is a need to work together with the people in positions of influence regarding policy implementation in the national systems. SR2 felt that *“the commitment of the Namibian government to improving the professional quality of educators is still quite strong”*. SR1 added that *“many RU graduates are in critical positions in the Namibian education system and these are the critical people who can do something with these researches”*. Thus, both of the staff members felt that there is sufficient political will in Namibia in favour of the MEdME programme.

The general perception of the staff members as discussed above, therefore, is that RU has sufficient and appropriate resources to implement the MEdME programme in Namibia. With these resources it would only be prudent to then scrutinize the issues of the MEdME programme implementation in Namibia.

6.4 THE MEdME PROGRAMME’S IMPLEMENTATION

This section discusses the issues of the MEdME programme implementation in Namibia. The section has seven main focus areas, namely: the activities involved in the implementation; justification of the activities; criticisms against the implementation processes; areas that need improvement in the implementation process; degree of success of the implementation; factors that contributed to the successful implementation; and finally, the challenges experienced during the implementation of the programme. These seven aspects will be discussed in detail in the order in which they are listed above.

6.4.1 What were the activities involved in the implementation of the programme?

I asked the staff members to describe the activities which are carried out as part of the implementation processes of the MEdME programme. I also asked them how the activities in the programme evolved if they did, and what implications that evolution had on the implementation process.

SR1 explained that for the first couple of years they *“offered a Master’s programme as a coursework programme where they had one year of course work and then one year of small*

scale research projects that resulted in a half thesis". The course work inspired the students to come up with their small research projects.

However, that changed. According to SR1 the change was prompted by the realisation that the programme *"has more impact and leverage if the research project is more substantial. Also, in terms of achieving our research capacity objectives ...we felt that half thesis researches were not as good and comprehensive as full thesis"*. The change had coincided with the change in capacity in the education department at RU as SR1 recognised that *"a half thesis is more capacity draining than a full thesis because you need expertise to offer the coursework"*. This however does not mean the university has no staff members to offer coursework but the *"full thesis programme proved to be more substantial, with a deeper scope and is of higher quality"*.

So the programme no longer has a coursework component, but students go straight into a research project. SR2 explained that currently the staff members' main activities involve *"a cycle of activities: the students work, bring it back to us via emails or at the contact session, we provide feedback on how else they could do it and open up issues that they didn't think of"*. According to SR2 *"all of that needs closer supervision because students come into the Master's with very little experience in research..."* the staff members' duty is to provide supervision to these novice researchers.

The other change to the programme was also shared by SR1: that he *"was appointed to a research chair which is funded by the National Research Foundation... Since that appointment, all our research projects needed to be crafted within the theme of visualisation"*.

According to SR1, the implications of these changes were that the admission criteria changed, *"...the entry requirements are now higher because we need people who already have a good idea of what the gaps are and the nature and state of maths education"*.

In summary, the MEdME programme has gone through a transformation from being a half thesis programme to a full thesis programme. Currently the main activity for the students in the programme is to write a thesis, while for the staff members it is to supervise the progress in the writing of that thesis. Regardless of the change, the objectives of the programme remain the same. In the next section I discuss the views of the staff members on whether these new activities are the most appropriate activities to achieve the objectives of the MEdME programme.

6.4.2 Justification of the activities

The two staff members were asked to discuss why they thought the activities they stated were the most appropriate activities to help in the achievements of the objectives of the MEdME programme. SR1 started his narrative by discussing the advantages and the disadvantages of both of the variants of the MEdME programme. Accordingly, the advantage of a MEdME by coursework was that there was *“more time to provide content input to the students...”* The disadvantage of the MEdME by coursework is that *“the research project was not that substantial, they were only half theses. The scope was much smaller, the research design was much narrower and findings were thus superficial”*.

With the full thesis, the advantage is that *“the students are committed to their research project for two years. The thesis is far more substantial, with richer findings”*. Another advantage is that *“the full thesis programme prepares student far better for the PhD”*. The disadvantage of the full thesis is that *“there is not enough space for mathematics content input”*.

Briefly, SR1 concluded that *“in the current climate the full thesis programme is still the better one because it is a far deeper endeavour, students need to read deeper and more widely and just by virtue of that activity, the critical reflexivity would have been impacted”*. SR2 also believes that the current activities are the most appropriate because the provision of quality supervision *“is the only way to get quality research. You can’t expect the Masters’ student to do all the work on their own...”*

However, even though the staff members thought that the activities are appropriate, there were criticisms by some MEdME programme’s graduates regarding the modality of implementing the MEdME programme. These are discussed in detail in the next section.

6.4.3 Criticisms against the MEdME programme’s activities

As discussed in Chapters 4 and 5 of this study, some graduates of the MEdME programme had two main criticisms against the MEdME programme, particularly the implementation processes. The first criticism came from most of the graduates who went through the full thesis programme, stating that the programme is not helpful to those who want to improve their mathematics content knowledge.

The second criticism was that the MEdME programme does not prepare graduates sufficiently to continue with publishing after graduating. According to those graduates, the programme should require a student to publish a paper in a credible journal before they graduate so that

they have a better idea of how to go about this in their professional lives. Below I discuss the responses of the staff members to the two criticisms.

6.4.3.1 The MEdME programme is not helpful in terms of mathematics content

Some graduates stated that they enrolled for the MEdME programme expecting that they would enhance their mathematics content knowledge but this did not happen. I therefore asked the staff members how valid they thought this criticism was.

SR1 *“agrees with the criticism to a certain extent”* but he also feels sorry for those who expected to enhance their content knowledge in this programme because according to him *“the aim of the programme is not to capacitate people mathematically but rather to capacitate them in terms of research in mathematics”*. This comment seems to be relevant considering that none of the specific objectives of the MEdME programme as discussed in Section 1.3 of this study states or implies enhancement of mathematical content knowledge. Enhancing of content knowledge is considered in the professional MEd as discussed in Section 1.2.2.1 of this study. Moreover, the overarching objective of the MEdME programme is reflexivity, i.e. to develop and grow critically reflexive practitioners who will actively contribute, and have the capacity, to act as agents of change in the transformation process of Mathematics Education in Namibia (Schäfer et al., 2014). Reflexivity, as discussed in Section 1.2.2.3 of this study, in my view has, in the context of the MEdME, little to do with subject content per se. SR1 however also explained that even though there is no course work, *“if students want to research on mathematics content, there is nothing stopping them from doing that”*. The same views were shared by SR2.

6.4.3.2 Many of the MEdME graduates have no idea how to publish in credible journals

In the interview I asked the staff members how valid they thought this criticism was. Both of the staff members indicated that this was an invalid criticism of the MEdME programme. SR1 for instance does not *“...agree with that view at all. At a PhD level that would be a very justified comment and certainly PhD students are required to write. The Master’s students are novice researchers and to be quite honest, not all of these Master’s theses are publishable work, they are good enough for a novice research and small case study but they wouldn’t be good enough for a substantial journal and we only publish in high ranking journals.”*

In addition, SR2 stated that he would be *“concerned if students needed to publish an article before graduating because ...it will also extend the duration of completing the degree because it takes over a year to submit an article for publication”*.

The shared view of the staff members is therefore, that at a Master's degree level, it would be inappropriate to require students to publish a paper before they graduate. This requirement is only appropriate at PhD level since those are more experienced researchers.

The discussions above indicate that RU has sufficient and appropriate resources to implement the MEdME programme. It was also discussed that the activities are viewed by staff members as the most appropriate for implementing this programme despite the two criticism by some graduates. The most relevant question now is whether the objectives of this programme have been attained and what contributed to the outcomes, which is discussed in the next section.

6.4.4 Which objectives have been attained, or have not, and what enabled or constrained them from being attained?

In this section I discuss the staff members' views on which objectives they believed have been attained or have not, and what they believe contributed to, or constrained, such attainment. There were three specific competencies that the MEdME programme aimed to achieve as stated earlier, namely:

1. To develop and grow critically reflexive practitioners.
2. To produce graduates that have grown in their own professions, including their capacity to research.
3. To produce graduates that have the capacity to act as agents of change in the transformation process of mathematics education in Namibia.

To evaluate the degree of attainment of these objectives from the staff members' perspectives I tried addressing four specific questions: Does the programme produce a reasonable number of graduates? Is the programme achieving its objectives in terms of making an impact in mathematics education in Namibia? How much does the programme impact on the learners' academic performance, if at all? And how satisfied are the staff members with the programme's implementation in Namibia so far? By addressing these questions, I believed I would have addressed the degree of attainment of the objectives. The factors that contributed or constrained the attainment of the objectives will be addressed separately in the next subsection.

Both of the staff members believed that the implementation of the programme was successful, however SR1 was more responsive in most of the questions in this part – possibly because he has been at the helm of this programme to date since its inception – while SR2 has not been involved as much in the programme lately. It is therefore likely that SR1 would be more aware

of the achievements of this programme than SR2. SR1 explained that on the number of graduates “... *on its own, over 38 masters is a big number*”. By this, SR1 was referring to the number of graduates of the MEdME programme, which by end of 2019 was 40 in total (although this number includes five graduate who are not Namibians). He further stated that the increasing number of MEdME degree holders has contributed hugely to the number of PhDs produced in the mathematics education department, citing that “... *there are a number of PhD students now who are moving within the system, and I think that is great achievement as well*”. In my view this achievement alone implies that the MEdME programme is achieving its objectives of addressing the lack of research capacity in mathematics education in Africa because research capacity is the fundamental requirement for graduating from this programme, as discussed earlier.

SR1 was however quick to clarify that stating the impact of this programme in Namibia is hard and needs empirical evidence. That is because to determine the impact of a programme the university “*will need to engage in a longitudinal study which may involve outside people... and agencies and this project [my study] is a step in that direction*”.

SR1 understands that the MEdME programme was introduced to address identified gaps as discussed earlier. From an anecdotal standpoint, however, SR1 holds the view that “*to address any kind of gap, you need qualified people...capacitated to engage in good and ethical research and with critical reasoning skills, writing skills, academic skills and all that skill that are involved in conducting research*”. He is convinced that their Master’s programme “...*has been a very appropriate programme in capacitating people with those skills*”. In my view this assertion implies that the MEdME programme has been successful in capacitating graduates with research skills. In Section 6.3.1 of this study I share a perception that capacitating students with research skills can mean that as graduates, these students – through research and critical analysis of the current systems – will have the capacity to act as agents of change in the transformation process of mathematics education in Namibia.

The claim made by SR1 that the graduates of the MEdME programme are equipped with research skills, triangulates well with the responses of the graduates as discussed in both Chapters 4 and 5, where the participants’ most cited aspect that they learned from the programme was research skills. Research is what this programme is all about and research is the genesis of solving educational problems as stated by SR1. It can therefore be argued that

the perception of SR1 that this programme is an appropriate tool to address the identified gaps and has succeeded in equipping graduates with research skills, is quite relevant.

SR1 also commented on the issue of developing and growing CRP, stating that he strongly believes that the programme influences students' reflexivity because it *"is a far deeper endeavour, you need to read deeper, you need to read more widely and just by virtue of that activity, the critical reflexivity would have been impacted"*. This means that the MEdME programme has been successful in producing CRPs. SR2 also shared similar sentiments stating that the programme has a stronger focus on creating graduates who can critique things and he believes that the career trajectory of most of their graduates is testimony to that.

On whether the programme has this far impacted on the academic performance of learners in Namibia particularly in mathematics, SR1 stressed, *"Establishing that performance in mathematics has improved because of this programme is very difficult to prove. In my interpretation, SR1 meant that this question cannot be answered without evidence and getting such evidence would require research on that matter.*

Lastly, staff members were asked whether they were satisfied with the implementation of the programme in Namibia so far. SR1 responded that he is *"delighted with the programme and what delights me the most is when I see what our students have achieved and where they are now. It is very satisfying to see them taking the opportunities that the Master's programme has opened for them"*. SR1 has further highlighted that although anecdotal, he understands that there are a number of their graduates who are in positions of influence, mainly in the Ministry of Education where they can drive METN. This perception triangulates well with the views of the graduates in both Chapters 4 and 5 where they indicated that the programme had influenced their career trajectories, critical reflexivity, professional lives and other areas of their lives.

In summary, the two staff members who participated in the interviews held the perceptions that the implementation of the MEdME programme in Namibia has been successful and the programme has attained its objectives. The staff members believe that the programme achieved its objectives because it:

- has so far produced 40 graduates;
- has equipped graduates to become CRPs (attained objective 1 listed above);
- has equipped the graduates with research skills (attained objective 2 listed above); and

- equipped graduates with professional competencies and placed them in the positions of influence where they can be agents of change and drive METN (attained objective 3 listed above).

This indicates that the staff members hold the view that the programme has attained all its specific objectives. With that in mind, the staff members were further asked to share their perceptions on what enabled the attainment of these objectives. Their views in this are discussed in the next section.

6.4.5 Factors that influenced the successful implementation of the MEdME programme and the attainments of its objectives

Staff members were further asked about what they thought were the factors that might have influenced successful implementation and attainment of the programme's objectives. The staff members held a view that one of the main factors toward the success of this programme is the availability of resources. In section 6.3.3.2 of this study, the staff members indicated that RU has appropriate and sufficient resources to implement the programme.

The staff members attributed the success of the programme mainly to the availability of human resources i.e. willing and able supervisors and students. SR1 recognised that the RU staff members are very committed to this programme, *"...Many of us love coming to Namibia ...the fact that we come to Namibia five times a year for face-to-face conduct sessions I think has contributed hugely..."* Furthermore, the Namibian students are also said to have a culture of commitment to their work. SR1 explained, *"The Namibian students are very serious.... I like working in that kind of context because you get the results because the students are productive"*.

Other critical inputs commended were the political will and financial recourses. SR1 stated that the MEdME programme is getting support from both RU and the Namibian government, *"Institutionally we are encouraged and supported to run this programme, and also we have a lot of support from Namibia, from the ministry, from NIED and of course from the students"*.

The MEdME programme also enjoys support from the South African National Research Foundation. *"They are not only interested in research in South Africa, but they see the research terrain on a regional and continental level"*. On infrastructure, SR1 stated that *"working at and with NIED is a context that works brilliantly, the hostel facilities are good and cheaper"*.

Other factors cited were the appropriateness and compatibility of the implementation activities with the programme objectives. SR2 recognised that the activities carried out in the implementation of the programme are the most appropriate and contribute a lot to the attainment of the objectives.

6.4.6 Challenges experienced in the implementation of the MEdME programme

The staff members described five different challenges they experienced in the implementation of the MEdME programme, namely: lack of intense collaboration with local institutions, time constraints, distances and costs of travelling to Namibia, the ethical approval issues and the challenges caused by the outbreak of COVID19. These challenges were identified by the staff and they are discussed in detail below.

6.4.6.1 Lack of intense collaboration with local institutions

SR1 indicated that despite the moral support the MEdME programme gets in Namibia *“I find the programme a little bit insular and isolated. Ideally, we should collaborate with UNAM, the ministry and other Namibian institutions, but that intense collaboration has not really happened”*. SR1 acknowledges that there is collaboration to some extent, stating, *“Many of my examiners are Namibians ...but I think the network could be broader”*.

SR1 also finds it *“difficult to understand that we don’t have a Namibian research agency. Our programme is quite isolated. We fly in, we fly out and that is it”*. SR1 appreciated the collaboration with NIED but, *“Even there our collaboration is a superficial one”*. RU wished to work with the curriculum developers and policy makers far more.

6.4.6.2 Time constraints

Staff members recognise the constraints of time for both the staff members and students. SR1 stated, *“...There are staff members who will rather not be involved because the personal commitment and the personal sacrifice is quite substantial”*.

SR2 believes time constraints are even more severe for students because all the MEdME students *“...have professional commitments as teachers and other personnel”*. Due to the challenge of balancing time, SR2 stated that some of his students dropped out of the programme.

6.4.6.3 Distances and costs of travelling to, and in, Namibia

SR1 indicated that some staff members would love to visit their students *“in their own villages and schools... but the cost and distance factor prevents us”*. This would suggest that the financial resources acknowledged earlier need to be boosted more to address this challenge.

6.4.6.4 The ethical approval issues

According to the National Health Research Ethics Council (NHREC), (2015) “A risk-benefit analysis should precede carrying out the research.” (p. 15). This is done so that participants are not exposed to unacceptable risks of harm on the basis that they are likely to benefit from the research. SR2 however had a concern that, *“...the bureaucratization of the South African ethical approval processes over the last number of years made it much more difficult for students to complete their proposals and have them accepted”*.

6.4.6.5 The challenges caused by the outbreak of COVID19

Both of the staff members echoed that the outbreak of COVID19 has been a huge setback in the delivery of the MEdME programme. The restrictions for travelling due to COVID19 prevented students and lecturers from meeting face-to-face to discuss and regulate the pace and progress of the research projects. The research sites have also been closed, hence the progress of the research projects were severely affected, to the extent that the duration of study had to be extended from the usual two years to three years, just to allow the students to catch up the lost time.

6.4.7 Are there issues about this programme that need improvement?

The staff members were asked if there was anything about the programme that needed to be improved.

SR1 identified two issues that he thought need improvement. Firstly, *“we have reached a point where the heavy emphasis on case study needs to be revisited”*. The students in the programme mainly carry out small case study projects, hence the findings of the project are often not generalizable. SR1 therefore believed that there is a *“need to start doing more longitudinal studies that go across regions. Policy makers do not like case studies because they normally have a narrow focus”*.

Secondly, the thesis audit done in Phase I of this study indicated that the current cohort of the MEdME programme is the fifth cohort focusing on the theme of ‘visualisation in the teaching

and learning of mathematics', hence SR1 thinks this theme is overexploited and they need to find other research foci.

6.5 CONCLUSION

This chapter presented the analysis, findings and discussions of the data obtained in the second part of Phase III of my study, which entailed the interviews with staff members. This chapter was based on the perceptions of the staff members towards the MEdME programme. The main aim of this chapter was to answer my research question 4. The chapter started with the problem definition by identifying the gaps that the MEdME programme was meant to address and how they were addressed i.e. by introducing the programme. The chapter further discussed how RU has sufficient and appropriate resources to implement the programme in Namibia. The staff members' views on how the programme was implemented was discussed by presenting the activities involved in the implementation. I then discussed the criticism of these implementation activities by some of the programme's graduates, and the staff members' views on how invalid the criticisms were and how appropriate these activities were for implementing this programme, despite the criticisms. The chapter further presented the staff members' views on how the objectives of the programme were all attained and the factors which contributed to that achievement. Finally, the chapter discussed the challenges experienced by the staff members in the implementation of the programme and how the programme can be improved, going forward.

CHAPTER 7

CONCLUSION

7.1 INTRODUCTION

In this final chapter, I offer a synthesis of the research, the goal of which was to evaluate the perspectives of the participating graduates on the outcomes of the MEdME programme ('the programme'). The programme was evaluated from the graduates' perspectives against three main objectives of this programme. The three main objectives were:

- To evaluate how the programme shaped the graduates' critical reflexive practices in mathematics education in Namibia; which is the short term outcome of the programme.
- To evaluate how the programme impacted on the graduates' career trajectories and research capacity; this is the intermediate-term outcome of the programme.
- To evaluate how the graduates perceive their individual enrollment in the programme, enabling and informing mathematics education transformation in Namibia; which is the long-term outcome of the programme.

Furthermore, this study also evaluated the perspectives of the programme's staff members on what they believed were the factors that enabled or constrained the attainment of the objectives above.

This chapter presents my response to the question: what lessons can be learned from the study? This is followed by recommendations of the study in terms of the data. I draw the discussion to a close by looking at some of the challenges I faced, and then I describe some of the conclusions that I reached. The chapter is therefore structured as follows:

- Synthesis of the study
- Summary of findings and lessons learned
- Recommendations
- Critical reflection on the study
- Conclusion

7.2 SYNTHESIS OF THE STUDY

This section provides a brief summary by giving the layout of the study and the link between the content of the chapters in this thesis.

Chapter 1 introduced the readers to the research project by describing the context of, and the motivation for the study. The chapter described that the rationale and purpose of this research was firstly to evaluate the programme against its stated objectives, and secondly, to evaluate the impact of the programme on its graduates' professional and personal lives, and on transforming mathematics education in Namibian. It was suggested in Chapter 1 that the findings of my study can shed light on the type of programme the MEdME is, which can enable and support change in Mathematics Education, particularly in Namibia. The findings can also shed light on how the MEdME programme may be strengthened and enhanced.

My study was framed to answer four specific research questions:

1. How has the MEdME programme shaped the graduates' critical reflexive practices in mathematics education in Namibia?
2. How has the MEdME programme impacted on the graduates' career trajectories and research capacity?
3. How (if at all) do the graduates perceive their participation in the MEdME programme to have contributed to mathematics education transformation in Namibia?
4. What has enabled or constrained the perceived impact of the MEdME from the lecturers' perspectives?

To answer these questions, I discussed in Chapter 1 that I needed to carry out an evaluation research. Chapter 2 therefore presented the conceptual and theoretical frameworks and the literature around the concept of programme evaluation. The chapter discussed the classification of programme evaluation as a research field and identified my study as a combination of an outcome evaluation and an impact evaluation. With regard to the impact however, my study only focuses on the impact of the MEdME programme on the graduates' reflexive practices, career trajectory, research capacity and on mathematics education transformation in Namibia from the perspective of the graduates. Secondly, Chapter 2 presented and discussed the concept of PT, the theory that underpinned my study.

In Chapter 3, I discussed the research methodology that enabled me to carry out the programme evaluation. The chapter described and justified the research methodology and methods used in

the study. I discussed how and why a survey questionnaire and two sets of interviews were used to collect the data. I also explained how these data collection techniques shaped the design of my study, which unfolded into a three-phase research design where Phase I entailed a thesis audit, Phase II a survey questionnaire to graduates and Phase III interviews with both graduates and the RU staff members. The chapter further discussed how the theses audit done in Phase I guided the selection of graduate participants, where the selection was done so that one participant was taken from each NCTM theme. Also, this selection was done so that each of the following career trajectory categories (CTC) were represented: promoted, transferred, changed job and remained in the same job/position. With the emphasis placed on the interpretation of the participants' perspectives in this study, Chapter 3 justified why my study was situated in the interpretive paradigm. Furthermore, issues of validity and reliability for this research, ethical considerations, some limitations of this study and the challenges experienced during this research project were all discussed in this chapter.

Chapter 4 presented the analysis, findings and discussions of the data obtained in Phase II from the 21 graduates who returned my questionnaire. The detailed analysis of this data generated the research findings for the research questions 1 to 3. This chapter was followed by Chapter 5 which consolidated the findings in Chapter 4. Chapter 5 also provided clarity and deeper contexts of issues raised by the graduates in Chapter 4 to supplement, clarify and/or extend on the data and use triangulation for the findings in Chapter 4.

In Chapter 6, I presented the analysis, findings and discussions of the data obtained in the interviews with the RU academic staff members who have been core to the MEdME programme since its inception. The detailed analysis of these interviews generated findings pertaining to the six elements of the MEdME Programme Theory, which provided me with an understanding of the design and rationale of the programme. The findings also supplemented and triangulated the findings in Chapters 4 and 5, in generating answers to my research questions – particularly research question 4. The essence of Chapter 6 was on evaluating the level of attainment of the specific objectives of the programme and what enabled or constrained the attainment of objectives, from the perspectives of the graduates.

7.3 SUMMARY OF FINDINGS AND LESSONS LEARNED

This section summarizes the key findings according to the four research questions. It also discusses the lessons that can be learned from the findings. In my interpretation, the lessons learned are the knowledge gained from the findings of this study. This includes positive and negative lessons. This section is presented in four subsections according to the research questions.

7.3.1 Research Question 1:

How has the MEdME programme shaped the graduates' critical reflexive practices in mathematics education in Namibia?

7.3.1.1 Background

In Chapter 1 of this study a critical reflexive practitioner (CRP) was described as a person who is self-introspective, can reflect in context and is a researcher. All the participating graduates agreed that the programme made them CRPs and many provided justifications of why they believed this. The findings from this question were classified as short-term outcomes of the MEdME programme, because, as discussed in Chapter 3 of this study, being a CRP can contribute directly to being an agent of change. The findings are discussed below.

7.3.1.2 Aspects learned in relation to participants' CRP

(i) Self-introspection

The participants believed that they became CRPs because they learnt how to self-introspect. This is when individuals interrogate themselves and their assumptions by asking themselves how their involvement, actions or reactions in any event would affect the end result. The participants attributed part of this learning to the programme, because during their studies they were expected to submit only high quality work to their supervisors, where every sentence used is really necessary and carries valuable data. Self-introspection and other analytical skills are also believed to be enhanced hugely during the data analysis stage in their studies. By practicing that kind of reflection under close supervision for two consecutive years, critiquing things before taking action becomes a habit. This is why all the participants believe that every graduate of this programme would be a self-introspective person.

(ii) Reflection in context

In Chapter 1, reflection in context was described as when an individual considers other people's views when reflecting on ideas. The graduates of this programme believe that they are willing

to entertain the possibility that there exist a multitude of different ways and/or views for everything. They attributed part of this belief to the MEdME programme because when doing research, students experience a lot of criticism and corrections, mainly as feedback from their supervisors. Such feedback sometimes challenges the only belief the student thought was true and this would normally compel them to adopt another belief – sometimes causing a paradigm shift.

(iii) Became research-oriented

Participants believed that the MEdME programme enhanced their research capacity viz. the ability, curiosity and willingness to do research. Their shared view was that all the MEdME graduates are equipped with research capacity because research is the compulsory requirement for graduating from this programme.

7.3.1.3 Lessons learned

From the findings above, I have learned that if programme designers anticipate developing CRPs they should ensure that the programme is defined by three main aspects, including:

- quality academic supervision by the staff members;
- students' positive dispositions towards the programme; and
- students' hard work and dedication.

These three aspects are considered instrumental in making sure that the students in the programme read extensively and invest a lot of time and energy in their academic work. I also learned from the graduates that the programme would likely have more leverage on graduates' reflexive practices if it included a coursework in its offerings.

7.3.2 Research Question 2:

How has the MEdME programme impacted on the graduates' career trajectory and research capacity?

7.3.2.1 Background

This question sought the participants' views on how the MEdME graduates' career trajectory and research capacity impacted on their capacity to be agents of change. As discussed in Chapter 3 of this study, being an agents of change in mathematics transformation is a medium-term outcome of the MEdME programme, because it contributes directly to METN.

This study found that from the participants' perspectives, the MEdME programme graduates are personnel who are of higher quality and are employable. As such, the participants shared a view that the programme:

- opened up opportunities and influenced appointments for some graduates, and
- opened up opportunities for further academic endeavours.

These findings are discussed more below:

7.3.2.2 The MEdME opened up opportunities and influenced appointment for graduates

This study found that out of the 21 participants, 15 (71.4%) experienced career advancements in the form of promotion(s) at work and they now hold the following positions after such promotions:

- one is a Chief Education Officer
- two are in Technical and Vocational Education and Training
- two are School principals
- three are lecturers (teacher educators) at local universities
- three are Heads of Department
- four are education officers in different regions

The remaining six (28.6%) of the participants did not experience any career advancement. However, four of these participants indicated that they remained teachers by choice. Only two of the six participants felt that the opportunities for promotion are still hard to get even though they are in possession of the MEdME degree, however they further clarified that getting a job at a preferred duty station is easier when in possession of a MEdME degree.

These findings further suggest that most of the participating graduates are in positions of influence in the Ministry of Education. Those who are still teachers are also resourceful teachers and as such, all of these graduates can influence the transformation of mathematics education.

7.3.2.3 The MEdME opened up opportunities for further academic endeavours

Another finding from my study was that the participants held the view that the MEdME programme enhanced their confidence in doing research, helped them discover the importance of doing research, improved their academic writing and also boosted their curiosity to do research. The curiosity, ability and love for reading and doing research challenged eight of the participants to carry out far bigger research studies, which later inspired them to enrol for a PhD.

7.3.2.4 Lessons learned

The findings above indicate that 71.4% of the MEdME graduates have experienced career advancement particularly after obtaining the degree. If we take this percentage to indicate the chances that an MEdME graduate will advance in their profession after graduation, we can see that the likelihood is very high. Personnel at the Ministry of Education who want to develop their careers may therefore enrol in the MEdME programme because the chances of getting promoted after earning that degree are greater than 70%. It is, however, currently not possible to say whether MEdME graduates have a higher or lesser chance than MEd graduates from other universities, such as UNAM. The main reason for this is that no comparable statistics from other universities could be obtained.

Another lesson is that there are graduates who have not yet seen progress, implying that obtaining an MEdME degree is not an automatic ticket to career progression; they must still work harder to demonstrate their abilities.

7.3.3 Research Question 3

How do the participants perceive their enrolment in the MEdME programme enabling and informing mathematics education transformation in Namibia?

7.3.3.1 Background

Mathematics education transformation in Namibia (METN) is the main objective (i.e. the long-term outcome) of the MEdME programme as discussed in Chapter 3 of this study. All the participants agreed that this objective is being achieved to a certain extent because:

- The graduates of this programme hold key positions in the Ministry of Education; hence their knowledge filters down to influence mathematic education nationally.
- The few graduates who do not hold key positions in the Ministry of Education are still contributing to METN in different ways, as discussed in Chapters 4 and 5.

The METN and the participants' contributions thereto are summarised as findings below.

7.3.3.2 The types of METN observed by the participants

The participants observed that mathematics education in Namibia has been transformed mainly in five different ways, which include improved:

- *Mathematics curriculum structure* – the participants observed that even though the level of mathematics taught in Namibia is not yet comparable at international level, the several reviews of the curriculum have advanced the content of the mathematics taught in Namibia, and this is a step in the right direction.

- *Mathematics teachers' qualifications* – the participants observed that many mathematics teachers have advanced their teaching qualifications, to be on par with and relevant as mathematics teachers, in the reviewed curriculum.
- *Teaching approaches* – the participants observed that to some extent many mathematics teachers are now willing and able to use appropriate visual representations in their lessons, including technology related tools.
- *Mathematics teachers' collaborations* – some participants observed that many teachers are now using social media and other technological platforms for educational interactions and CPDs.
- *Teachers' confidence* – the participants observed that mathematics teachers are now more confident in their teaching of mathematics, which might have resulted from the other transformations discussed above.

7.3.3.3 Participants contributed to the observed METN

All the participants believed that they played a significant role in METN through:

- development of the mathematics curriculum and the monitoring of its implementation;
- training of mathematics teachers – either through workshops and congresses or as teacher educators;
- their higher quality teaching of mathematics
- creating opportunities for teacher collaborations;
- encouraging and inspiring other teachers to study further;
- published papers and books which can influence the teaching approaches in mathematics;
- setting and/or marking of national assessment items of mathematics; and
- Their MEDME research which has made a contribution in Namibia. It has inspired them, and can inspire other readers to improve their teaching. Some participants believed that their theses were instrumental to the curriculum design in Namibia as discussed in Chapters 4 and 5 of this study.

7.3.3.4 Lessons learned

It can be deduced from the findings of my research question 3, that in order for transformation to occur, people must be equipped with research skills. These individuals will then lead the transformation from a position of knowledge, using empirical facts to back up their decisions.

Furthermore, the data show that there are other aspects of mathematics education that can and should be improved. Only 21 graduates identified the transformations mentioned in this study. If the transformations indicated by the 21 participants in this study were true, one can only imagine the enormity of the transition that would occur if there were more graduates. The lesson here is that transformation in mathematics education is required everywhere, and by training more people to enable them to contribute to the transformation, the likelihood and extent of the anticipated transformation can be maximized.

It is also worth noting that many of the features of transformation described in this study can only occur over time. Take, for example, the structure of a mathematics curriculum. This is not something that can be accomplished overnight. The lesson is therefore that transformation of mathematics education is a process that may take a long time to occur and hence requires unity of purpose, consistency and patience.

7.3.4 Research Question 4

What has enabled or constrained the perceived impact of the MEdME from the lecturers' perspectives?

7.3.4.1 Background

The two interviewed lecturers felt that the MEdME programme has been successful and has made an impact in Namibia because it has produced 40 graduates so far, equipped graduates to become CRPs, equipped the graduates with research skills and professional competencies, and placed them in the positions of influence where they can be agents of change and drive METN.

7.3.4.2 What enabled the perceived impact of the MEdME programme in Namibia?

According to the two interviewed staff members, the perceived impacts of this programme were enabled by the availability of appropriate and sufficient resources (also ‘critical inputs’) which are needed for a successful implementation of this programme, including:

- human resources i.e. willing and able supervisors and students for the programme;
- time for students to engage in research and staff members to provide quality supervision;
- financial resources for students to pay their fees and for the university to run the programme;
- infrastructure including classrooms, accommodation for students and staff members;
- internet and connectivity to enable students to find literature and for communication purposes; and
- political will from the Namibian government through the Ministry of Education, to allow the offering of this programme in Namibia by a foreign university.

7.3.4.3 Lessons Learned

The findings to question 4 above indicate that the provision of critical inputs is indeed crucial to the success of the programme's implementation. Looking at the six critical inputs listed, it is clear that lacking even one of them could threaten the programme's viability. Lack of internet and connections, for example, may not prevent the programme from being offered, but doing so without these resources would be challenging. As a result, a lesson can be learned here: the successful implementation of a programme like this requires a balance in the provision of resources. The degree of success in the implementation and the impacts of such a programme can be jeopardized if inadequate and insufficient resources are provided.

7.3.5 The MEdME Programme Theory

In Chapter 2, this study was classified as a Theory-Driven Programme Evaluation (TDPE) because it attempts to align with the PT of the MEdME programme in Namibia. A PT was defined as an implicit assumption about how the implementation of a programme's activities is supposed to achieve the intended outcomes (Chen, 2005). PT includes the identification of “resources, activities, and outcomes of a programme and the causal assumptions that connect these” (Wholey, 1987, p. 77). This study therefore also intended to make explicit the PT of the

MEdME programme against which this study attempted to align. In Chapter 3, the framework in Figure 7.1 below was identified as a framework for any programme's PT.

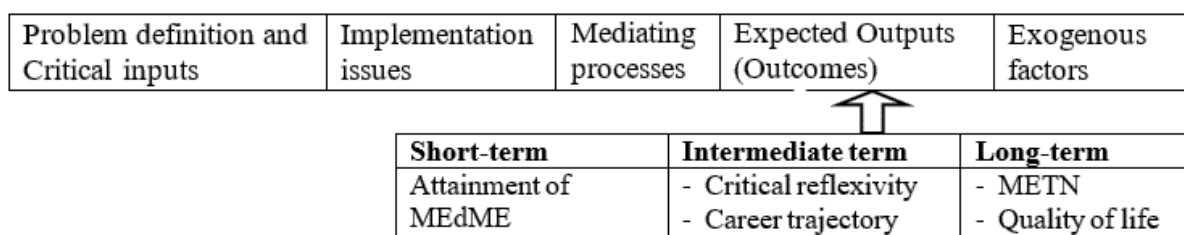


Figure 7.1. The MEdME Programme Theory framework

The PT of the MEdME programme is therefore dependent on whether:

- the availability of the critical inputs as identified in 6.3 are guaranteed;
- the necessary implementation activities are carried out as discussed in 6.4, with the prevalence of the favourable exogenous factors as also discussed in 6.4; then
- the mediation processes will occur as discussed in 6.4, leading to the outcomes as discussed in Chapter 4 and 5 and in Section 6.3.

By achieving the programme outcomes the MEdME programme will always be an appropriate tool to address the problems as defined in 6.2.

7.4 RECOMMENDATIONS

Based on the findings of this research, although there has been METN, I argue that more can and should still be done to bring about further METN and make mathematics education in Namibia comparable at international level. It is therefore recommended that:

- More mathematics teachers study further in order to enhance their research capacity and be instrumental to METN. Through studying and participating in other CPDs, mathematics teachers can enhance their knowledge and remain relevant as mathematics teachers at any level.
- There is a need for a national campaign on mathematics teachers' content update. This is owing to the curriculum reviews which have rendered some teachers' pedagogic and/or subject content knowledge insufficient or irrelevant to teach the new content.
- The MEdME programme reintroduce coursework as part of the programme so that it also enhances the graduates' mathematics content knowledge.
- Rhodes University may also consider offering a Professional MEd, as it might also be a suitable degree with a stronger mathematics content focus than the MEdME.

Regarding the MEdME theses, it is recommended that:

- The MEdME research findings should be presented in mathematics workshops, congresses and in papers so that the knowledge can reach the right personnel who can use it appropriately. This is because the knowledge produced in these researches have the potential to contribute to METN.
- A research bank be established in Namibia where scholars can upload their theses to share the knowledge they have discovered.
- The Ministry of Education needs to avail fees to fund research so that scholars can be enabled and encouraged to research more and produce the knowledge necessary for better transformation in mathematics education in Namibia.

7.5 LIMITATIONS OF THE STUDY

This study is an interpretive research project which evaluated the impact of the MEdME programme from the perspectives of the graduates. As such, there were four main limitations in terms of this study:

- The findings of this research project are mainly based on a novice researcher's (myself) own interpretations of the participants' views. I also designed and used the research instruments myself. However, I depended confidently on the advice and supervision of two highly experienced researchers who were my supervisors.
- The study did not provide any verifiable evidence of the outcomes described by the participants, which makes the findings quite anecdotal. Finding verifiable evidence of this nature may require a different type or design of research.
- The participants were aware that no verification of data will be done, which made it quite easy for them to provide unverifiable and possibly delusive data.
- Some graduates decided not to participate in this study for different reasons. Some participants withdrew their participation at very critical times during my data collection, which was a challenge. For that reason, even though the participants were a good representative of the population, there were some unheard views which might have made a significant contribution to the findings of this study.

7.6 AVENUES FOR FURTHER RESEARCH

Based on the findings and limitations of this study, this study suggests that:

- Being small-scale in the sense that it is only done in one subject, this research does not allow for much generalisation, but creates the opportunities and direction for further research on a larger scale. A similar study can therefore be carried out in the other MEd programmes offered by Rhodes University to generate more generalizable findings.
- As alluded to earlier, this study did not provide any verifiable evidence of the outcomes described by the participants. A different study with a different research design needs to be conducted to find the outcomes of the MEdME programme with verifiable evidence of such outcomes.

7.7 CRITICAL REFLECTION OF THE RESEARCH JOURNEY

The existing research literature on programme evaluation concentrated more on studies conducted for professional goals (applied research) than those conducted for academic (scholarly) goals. My research, on the other hand, is completely academic in nature, with a focus on evaluating the impact of the MEdME programme from the perspectives of its graduates. Because the research was guided by a PT which is commonly used in programme evaluation globally, the findings of this study may contribute to the present evaluation research literature, particularly in the Namibian setting.

During my literature review, I did not find any programme evaluation study conducted for academic purposes in Namibia, therefore this study is undoubtedly unique in the country. The Namibian programme evaluation research arena has earned a place in the global programme evaluation field due to the distinctiveness of this study. Namibia is therefore currently one of the countries in the world to have conducted a programme evaluation study focused on the impact of an academic programme. Furthermore, the findings of this study will add to the existing research literature and may be useful to novel researchers in the field of mathematics education.

The long-term goal of the MEdME programme was to transform mathematics education in Namibia. According to my research, the programme has been successful in achieving this goal to some extent. The study also attempted to align with the MEdME PT by describing the programme's features in terms of PT's general elements. This underlines another distinctive contribution to the present research literature that this study makes. This can also show the reader that the findings of this study do not contradict the current literature on programme

evaluation research. The findings, on the other hand, add to the current literature by underlining the need for more formative programme evaluation.

7.8 CONCLUSION

This final chapter concludes my thesis by providing a summary of the research findings and highlighting the significance of the study. It offered some recommendations and avenues for further research. I also discussed the limitations and then reflected on the impact that this study may have on the current academic and professional context in Namibia.

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PARTICIPANT INFORMED CONSENT

INFORMED CONSENT DECLARATION

(Participant in the filling of questionnaire)

Project Title: *An evaluation of the impact of the Rhodes University Master of Education in Mathematics Education (MEdME) programme in Namibia from the perspectives of its graduates*

Mr. Johannes David, a Master of education student in the Department of Mathematics Education, Rhodes University has requested my permission for me to participate in the above-mentioned research project.

The nature and the purpose of the research project and of this informed consent declaration have been explained to me in a language that I understand.

I am aware that:

1. The purpose of the research project is to evaluate the MEdME against its stated objectives, and to assess the impact of the MEdME on the graduates and on the mathematics education terrain in Namibia, from the graduates' perspectives.
2. The Rhodes University has given ethical clearance to this research project and I have seen the clearance certificate.
3. By participating in this research project I will be contributing towards the improvement of the programme and its implementation. The findings may be used formatively to serve as a catalyst for change, to possibly enhance improvement in the further implementation of this, and other similar programmes, and also contribute to the evaluation discourse, research and evaluation field at large. The findings will also serve

as feedback to the university on how the Programme is perceived to impact on its graduate and on the mathematics education terrain in Namibia.

4. I will participate in the project by filling in a questionnaire in the most honest way and with the seriousness this study deserves.
5. My participation is entirely voluntary and should I at any stage wish to withdraw from participating further, I may do so without any negative consequences.
6. I will not be compensated for participating in the research, but my out-of-pocket expenses may be reimbursed.
1. There may be risks associated with my participation in the project, but the level of risk is very low and there are suggested ways to mitigate against such potential risks. The only possible risk that I can anticipate is:
 - a) The questions in the questionnaire may require me to divulge private information regarding my career trajectories. To mitigate against any risk of embarrassment I am assured that my participation is anonymous and that my identity will not be revealed.
 - b) Participation in this study will eat into my private daily programme and I might be asked to change some of my schedules to accommodate the participation in the study. To mitigate against this I am informed that a fairly sufficient time will be afforded for me to complete the questionnaire.
 - c) If the findings show that the programme has little or no positive impact on the graduates, it might compromise on the nature of future offering of this programme and Rhodes University would need to possibly redesign the programme.
2. The researcher intends publishing the research results in the form of a Master's Thesis. However, confidentiality and anonymity of records will be maintained and that my name and identity will not be revealed to anyone who has not been involved in the conduct of the research.
3. I will receive feedback through this study's thesis which will be available in hard copy with the supervisor and co-supervisor, and a soft copy will be available on the RU theses repository.
4. Any further questions that I might have concerning the research or my participation will be answered by Mr. David Johannes, +264813799566, fressdave@gmail.com.

5. By signing this informed consent declaration I am not waiving any legal claims, rights or remedies.
6. A copy of this informed consent declaration will be given to me, and the original will be kept on record.

I,have read the above information / confirm that the above information has been explained to me in a language that I understand and I am aware of this document's contents. I have asked all questions that I wished to ask and these have been answered to my satisfaction. I fully understand what is expected of me during the research.

I have not been pressurised in any way and I voluntarily agree to participate in the above-mentioned project.

.....

Participants signature

Witness

Date

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QUESTIONNAIRE SCHEDULE FOR DAVID JOHANNES MEDME EVALUATION STUDY 2020

RESEARCH TOPIC: An evaluation of the impact of the Rhodes University Master of Education in Mathematics Education (MEdME) programme in Namibia from the perspectives of its graduates

Thank you for agreeing to be part of this study. The purpose of the study is to assess the impact of the MEdME on the graduates' lives and on Mathematics education terrain in Namibia. It is therefore important for you to be honest in answering the questions in this questionnaire. It will also be of great help if you answer all the questions in this questionnaire as each question is meant to collect a different data. In this study, I will maintain anonymity and the information you provide in this questionnaire will be kept confidential. Hence you are not required to write your name on this questionnaire.

PART I: PERSONAL PROFILE

1. In which year did you register and graduated respectively, for the MEdME?

Year of Registration	
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Year of Graduation	
--------------------	--

2. What motivated you to enrol for the MEdME programme?

3. What were your main expectations from the programme?

4. To what extent were your expectations for the MEdME met? *(please elaborate on your selection)*

a) ☐ Exceeded my expectations

b) ☐ Perfectly met my expectations

c) ☐ Partly met my expectations

d) ☐ Did not meet my expectations

PART II: CAREER TRAJECTORY AND QUALITY OF LIFE

1. What position(s) did you hold in your job before you studied towards the MEdME (please provide the position held, and the year(s) – e.g. 2000 – 2003 teacher; 2004 – 7 HOD)

2. How has your career trajectory progressed after you obtained a MEdME *(please tick as appropriate)*

a) ☐ Promoted

b) ☐ Transferred

c) ☐ Remained in the same job and position

d) ☐ Changed to another job outside Ministry of Education

3. In what ways did the MEdME contribute towards your career trajectory (if at all)?

4. In what ways has the MEdME programme influenced your professional life (if at all)?
Briefly describe how?

PART III: MATHEMATICS EDUCATION TRANSFORMATION IN NAMIBIA (METN)

1. Literature suggests that there is a need for mathematics education transformation in Namibia. Do you believe that there has been any transformation in Mathematics education in Namibia since your graduation with a MEdME?

YE	NO
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2. Describe the type of transformation you have observed in mathematics education in Namibia?

3. Do you believe that there is still a need for transformation in mathematics education in Namibia?

YES	NO
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4. What kind of transformation in mathematics education is still needed in Namibia? (*please give a brief description*)

5. What role have you played in the transformation of mathematics education in Namibia since you enrolled in the MEdME programme?

6. In what ways do you believe your MEdME research project has contributed to the transformation of mathematics education in Namibia?

7. Do you believe that you have a role to play in the transformation of mathematics education in Namibia? Please elaborate.

8. Do you believe that the MEdME programme has contributed to the transformation of mathematics education in Namibia? Please elaborate.

PART IV: CRITICAL REFLEXIVE PRACTICE

Reflexivity is the act of thinking about and questioning your own assumptions and what such assumptions bring to any situation.

1. What did you learn from the MEdME programme in terms of your own practice? (*please elaborate briefly*)

2. Has your involvement in the MEdME programme contributed to you changing the way you do your job (e.g. the way you talk and act during the lessons)? Please elaborate your answer.

3. Would you agree that you have learnt all what the MEdME aimed to teach you? If yes, what enabled you to learn all of it? If no, what prevented you to from learning all of it?

4. In your view, did you have the right attitude to learn all what the MEdME aimed to teach you? Please elaborate your answer.

-
-
-
-
-
5. What more do you think you needed to learn from the MEdME programme which would be helpful in the performance of your job and your professional life?

-
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-
-
-
6. An element of reflexivity is *decentring*. This means that you need to provide opportunities for your learners to recognize conflicting perspectives on a topic. How do you (*or would you*) practice decentering in your own mathematics lessons?

-
-
-
-
-
7. Reflexivity also entails *experiential learning* which requires teachers to influence learners to question their choices, by reflecting on the assumptions that led to their choices. Do you believe that the MEdME programme has prepared you well enough to facilitate *experiential learning* in your mathematics lessons? Please elaborate.
-
-
-
-

PARTICIPANT INFORMED CONSENT

INFORMED CONSENT DECLARATION

(Participant in the one-on-one interview)

Project Title: *An evaluation of the impact of the Rhodes University Master of Education in Mathematics Education (MEdME) programme in Namibia from the perspectives of its graduates*

Mr. Johannes David, a Master of education student in the Department of Mathematics Education, Rhodes University has requested my permission for me to participate in the above-mentioned research project.

The nature and the purpose of the research project and of this informed consent declaration have been explained to me in a language that I understand.

I am aware that:

7. The purpose of the research project is to evaluate the MEdME against its stated objectives, and to assess the impact of the MEdME on the graduates and on the mathematics education terrain in Namibia, from the graduates' perspectives.
8. Rhodes University has given ethical clearance to this research project and I have seen the clearance certificate.
9. By participating in this research project I will be contributing towards the improvement of the programme and its implementation. The findings may be used formatively to serve as a catalyst for change, to possibly enhance improvement in the further implementation of this, and other similar programmes, and also contribute to the

evaluation discourse, research and evaluation field at large. The findings will also serve as feedback to the university on how the Programme is perceived to impact on its graduate and on the mathematics education terrain in Namibia.

10. I will participate in the project by availing myself for a one-on-one interview session.
11. My participation is entirely voluntary and should I at any stage wish to withdraw from participating further, I may do so without any negative consequences.
12. I will not be compensated for participating in the research, but my out-of-pocket expenses will be reimbursed.
13. There may be risks associated with my participation in the project, but the level of risk is very low. The only possible risk that i can anticipate is:
 - d) Participation in this study will eat into my private daily programme and I might be asked to change some of my schedules to accommodate the participation in the study. To mitigate against this I am informed that the researcher will be sensitive when making interview arrangements to seek mutually convenient times.
 - e) If the findings show that the programme has little or no positive impact on the graduates, it might compromise on the nature of future offering of this programme and Rhodes University would need to possibly redesign the programme.
14. The researcher intends publishing the research results in the form of a Master's Thesis. However, confidentiality and anonymity of records will be maintained and that my name and identity will not be revealed to anyone who has not been involved in the conduct of the research.
15. I will receive feedback in the form of firstly, *member checking* where I will get the interview transcripts and the interpretations of the transcripts for me to verify the accuracy of the information and the interpretation. I will be asked to edit, clarify, elaborate, and if needed, delete my own words from the narratives. This will ensure the true value of the data which can ensure external validity. Secondly I will get feedback through the thesis from this study which will be made available to me in hard copy, and a soft copy will be available on the RU theses repository.
16. Any further questions that I might have concerning the research or my participation will be answered by Mr. David Johannes, +264813799566, fressdave@gmail.com.

17. By signing this informed consent declaration I am not waiving any legal claims, rights or remedies.
18. A copy of this informed consent declaration will be given to me, and the original will be kept on record.
19. Request to take voice recording for this study during the interview was made and consent has been granted.

I, have read the above information / confirm that the above information has been explained to me in a language that I understand and I am aware of this document's contents. I have asked all questions that I wished to ask and these have been answered to my satisfaction. I fully understand what is expected of me during the research.

I have not been pressurised in any way and I voluntarily agree to participate in the above-mentioned project.

.....

Participants signature

Witness

Date

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Room 220, Main Admin Building, Drostdy Road, Grahamstown, 6139

INTERVIEW SCHEDULE (Graduates)

FOR DAVID JOHANNES' MEDME EVALUATION STUDY 2020

RESEARCH TOPIC : *An evaluation of the impact of the Rhodes University Master of Education in Mathematics Education (MEdME) programme in Namibia from the perspectives of its graduates*

Thank you for agreeing to be part of this study. The purpose of the study is to evaluate the Rhodes University MEdME in terms of how it has shaped the graduates' critical reflexive practice, how it has impacted on the graduates' career trajectory and quality of life, and how the graduates' individual research project has enabled transformation in mathematics education in Namibia.

It is therefore important for you to be honest and provide me with as much information as possible in answering the questions during this interview. It will also be of great help if you answer all the questions during this interview as each question is meant to collect specific data. If there is a question you do not understand, please feel free to ask for clarity. In this study, the information you provide during this interview will be kept confidential and used for the purpose of the study only.

PART I: PERSONAL PROFILE

5. In which years did you register and graduate for the MEdME respectively?

6. What motivated you to enrol for the MEdME programme?

7. What were your main expectations from the programme?

8. To what extent were your expectations for the MEdME met? (*Please elaborate*)

PART II: CAREER TRAJECTORY AND QUALITY OF LIFE

5. What position(s) did you hold in your job before you studied towards the MEdME (please provide the position held, and the year(s) – e.g. 2000 – 2003 teacher; 2004 – 7 HOD)

6. Tell me about how your career evolved after you obtained your MEdME.

7. In what ways do you think the MEdME contributed towards your career trajectory (if at all)?

8. May you please describe briefly how the MEdME programme influenced your professional life (if at all)?

9. How has your participation in the MEdME contributed to your quality of life (if at all)? Please elaborate.

PART III: MATHEMATICS EDUCATION TRANSFORMATION IN NAMIBIA (METN)

9. Literature suggests that there is a need for mathematics education transformation in Namibia. Do you believe that there has been any transformation in Mathematics education in Namibia since your graduation with a MEdME? Please elaborate.

10. Do you think that there is still a need for transformation in mathematics education in Namibia? Please elaborate.

11. Do you think that you have a role to play in the transformation of mathematics education in Namibia? Please elaborate.

12. Please share with me the role you have played in the transformation of mathematics education in Namibia since you enrolled in the MEdME programme. What are your future plans in this regard?

13. In what ways do you think your MEdME research project has contributed to the transformation of mathematics education in Namibia?

14. How do you think the MEdME programme has contributed to the transformation of mathematics education in Namibia? Please elaborate and provide evidence to support your claim.

PART IV: CRITICAL REFLEXIVE PRACTICE

Critical reflexive practice is when a person think about their own perceptions about a particular situation/thing and further reflects on what such perspectives bring to any situation. For instance, if a person start to think about why they have a particular believe and what such believe make them do, such a person is being a critical reflective practitioner.

8. What did you learn from the MEdME programme in terms of your own practice? (*please elaborate briefly*)

9. Has your involvement in the MEdME programme contributed to you changing the way you do your job (e.g. the way you talk and act during the lessons)? Please elaborate your answer. (*To be personalized according to the position the interviewee holds*)

10. Would you agree that you have learnt ALL what the MEdME aimed to teach you? If yes, what enabled you to learn all of it? If no, what prevented you to from learning all of it?

11. In your view, did you have the capacity and the right attitude to learn ALL what the MEdME aimed to teach you? Please elaborate on your answer.

12. What else do you think you needed to learn from the MEdME programme which would be of value in the performance of your job and your professional life?

13. An element of reflexivity is *decentering*. This means that you need to provide opportunities for your learners to recognize conflicting perspectives on a topic. How do you (*or would you*) practice decentering in your own mathematics lessons?

14. Reflexivity also entails *experiential learning* which requires you as a teacher to encourage your learners to question their choices, by reflecting on the assumptions that led to their choices. Do you believe that the MEdME programme has prepared you well enough to facilitate *experiential learning* in your mathematics lessons? Please elaborate.

15. What were the challenges you experiences during your studies which had the potential to prevent you from attaining the objectives of the MEdME programme? How did you deal with these challenges?

Is there any other thing about the MEdME programme in Namibia that you would like to share with me?

Thank you for your participation!

INTERVIEW SCHEDULE (Staff members)

FOR DAVID JOHANNES MEDME EVALUATION STUDY 2020

RESEARCH TOPIC: *An evaluation of the impact of the Rhodes University Master of Education in Mathematics Education (MEdME) programme in Namibia from the perspectives of its graduates*

PART I: PERSONAL PROFILE

9. For how long have you been a lecturer in the field of mathematics education at Rhodes University?

10. For how many years have you been involved in the MEdME programme in Namibia?

11. What has your role been in the MEdME programme in Namibia?

12. How many MEdME graduates have you supervised or co-supervised to date in the period specified in question 1?

PART II: PROBLEM DEFINITION AND CRITICAL INPUTS

1. There are a number of universities in Namibia who are offering a Master of Education degree in Mathematics education, e.g. UNAM. However, RU still offers the MEdME in Namibia. What gap is RU addressing through this programme which the other universities are not able to address?

2. In your view, is the MEdME programme the appropriate tool to address the gap you described in question 1 above? Please elaborate.

3. What resources are needed for the successful implementation of the MEdME programme in Namibia?

4. Do you think that RU has appropriate and sufficient resources for the successful implementation of the MEdME programme in Namibia? Please elaborate.
-

PART III: IMPLEMENTATION ISSUES AND *MEDIATING PROCESSES*

15. What do you understand the aims and objective of the MEdME programme in Namibia to be?
-

16. Do you think that you are achieving these?
-

17. In your view, do you think that these activities are the most suitable activities befitting the implementation of the MEdME for optimal attainment of the objective? Please elaborate.
-

18. Has the implementation of the MEdME programme in Namibia been a success? Please elaborate.
-

19. What has contributed to this success? Please elaborate.

20. What were the main challenges that you faced in the implementation of the MEdME programme in Namibia? How did you deal with these challenges?
-

21. What are the main achievements of the MEdME programme in Namibia?
-

22. How has the MEdME programme in Namibia, and the activities involved in its implementation, evolved over the years since its inception? Please elaborate on the changes that have taken place.
-

23. Why were there changes in the course of the last 10 years to the MEdME programme and the activities involved in its implementation?
-

24. What have these changes contributed to the implementing the MEdME programme in Namibia?

25. Would you suggest any other changes to the MEdME programme and its implementation in Namibia? Please elaborate.

26. Has the research focus of the MEdME changed over the years? Please elaborate.

27. I have learnt that initially you offered the MEdME as a coursework/half thesis course, but now it is exclusively offered as a full thesis only? Why is this the case? Please elaborate.

28. Do you collaborate with UNAM or any other local university in offering this programme? Please elaborate.

29. Who else do you collaborate with in offering this programme?

PART IV: CONTEXTUAL FACTORS

16. What have been the contextual factors that have enabled the successful implementation of the MEdME programme in Namibia?

17. Have there been any contextual factors that have hindered the successful implementation of the MEdME programme in Namibia? Please elaborate.

18. Why do you offer this programme in Okahandja?

19. Do you have any insights into how the MEdME programme has impacted on the professional lives of the graduates?

Is there any other thing about the MEdME programme in Namibia that you would like to share with me?

Thank you for your participation!



Human Ethics subcommittee
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NHEEC Registration no: REC-241114-045

28 February 2020

Johannes David

Review Reference: 2020-1113-3284

Email: g17d8189@campus.ru.ac.za

Dear Johannes David

Re: Evaluation of the impact of the RU/ MEid in Mathematics Education program in Namibia from the perspectives of its graduates

Principal Investigator: Prof Marc Schaffer

Collaborators: Mr. Johannes David

This letter confirms that the above research proposal has been reviewed and **APPROVED** by the Rhodes University Ethical Standards Committee (RUESC) – Human Ethics (HE) sub-committee.

Approval has been granted for 1 year. An annual progress report will be required in order to renew approval for an additional period. You will receive an email notifying when the annual report is due.

Please ensure that the ethical standards committee is notified should any substantive change(s) be made, for whatever reason, during the research process. This includes changes in investigators. Please also ensure that a brief report is submitted to the ethics committee on the completion of the research. The purpose of this report is to indicate whether the research was conducted successfully, if any aspects could not be completed, or if any problems arose that the ethical standards committee should be aware of. If a thesis or dissertation arising from this research is submitted to the library's electronic theses and dissertations (ETD) repository, please notify the committee of the date of submission and/or any reference or cataloging number allocated.

Sincerely

Prof Roman Tandlich

Chair: Human Ethics sub-committee, RUESC- HE

THE THESES AUDIT FOR THE ME_dME GRADUATES' THESES 2007 – 2018

Year of graduation	Participant Name	Thesis title	Main findings	Keywords/Key concepts	NCTM Principle
2008	Luwango Luiya	Critical reflective teaching practice in three mathematics teachers	- Participants reflect extensively on their classroom practice. - Reflecting on practice enables teachers to analyse and evaluate their teaching in line with effective mathematics teaching. - Critical reflection leads to the identification of weaknesses in teachers' classroom practice which culminates in better planning where alternative approaches to teaching are exercised.	- Critical reflection in teaching - Classroom practice - Mathematics teaching - Practical professional knowledge - Exemplary teaching practices - Teachers' consciousness - Superior quality teaching.	Teaching
2008	Charity M. Ausiku	An investigation into the persistence of traditional teaching methods in grade 9 mathematics classrooms in Rundu: a case study	- Inadequate teacher-training, controversial educational policies and challenges such as over crowdedness in mathematics classrooms, lack of teaching and learning materials, lack of cooperation among mathematics teachers and learners' negative attitude towards mathematics are some of the contributing factors to the persistence of traditional teaching methods in mathematics classrooms. - Teachers in this study understand the theoretical aspect of the LCE framework better than they are able to implement it. The persistence of traditional teaching methods in mathematics classes can no longer be attributed to the lack of understanding of LCE.	- Persistence of traditional teaching methods - Learner-centred approach - Teacher-Training - Cooperation among mathematics teachers - Learners' negative attitude towards mathematics	Teaching
2008	Augustinus Muyeghu	The use of the van Hiele theory in investigating teaching strategies used by Grade 10 geometry teachers in Namibia	- The selected mathematics teachers have a good conceptual understanding of geometry as all of them involved in this study were able to facilitate the learning and teaching of geometry that is consistent with the van Hiele levels 1 and 2	- Model for proficient teaching - van Hiele model of geometric thinking - Teaching strategies - Teaching of Geometry - van Hiele levels 1 and 2 - Grade 10 mathematics teachers - Teaching proficiency	Teaching
2008	Amon Haufiku	An investigation of lower primary (LP) teachers' content knowledge of mathematics in Ohangwena region in Namibia	- The mathematical proficiency of LP teachers is below the Grade 7 Mathematics content. - LP education is receiving very little support from the Ministry compared to other phases. - There are no workshops or training courses organised for LP teachers. They do not receive enough textbooks and materials, their classrooms are overcrowded and teachers cannot pay attention to individual learners. - There is a dire need for LP Head of Departments (HODs) who are specialised at LP	- Mathematics proficiency - Lower primary teachers - Content knowledge - Learners' poor performance in mathematics.	Equity Curriculum

2008	Alex Mbonabi Ilukena	A needs analysis for the implementation of a complementary course in mathematics education for teachers of mathematics in Namibia. A case study.	Despite the training that the three BETD mathematics graduates in this study received, the level of mathematics taught in a complementary course, such as an ACE, would clearly better equip mathematics teachers to teach proficiently and facilitate access to institutions of higher learning such as universities. There was a need for the implementation of a complementary course to the BETD in mathematics education for teachers of mathematics in Namibia.	Complementary course Teaching for mathematics proficiency BETD Subject content knowledge Pedagogical content knowledge Mathematics school teachers Mathematics college lecturers Professor of mathematics education	Equity Teaching
2008	Muhongo Mateya	Using the van Hiele theory to analyse Geometrical conceptualisation in grade 12 students: a Namibian perspective	Many of the participants (Grade 12 learners) in this study have a weak conceptual understanding of geometric concepts Only one student from School B attained van Hiele level 4 The Namibian Grade 12 geometry syllabus is not aligned with the van Hiele levels of geometric thinking There is a need for the use of appropriate and correct language in geometrical thinking and problem solving.	- Geometric thinking - van Hiele level Grade 12 students van Hiele Geometry Test Clinical interview with	Learning Equity
2008	Elizabeth Mutuku	Understanding the Differences in Marking Performance of JSC Mathematics Markers in Namibia: A Case Study	The markers' mathematical content knowledge had influenced their marking performance. There are other factors that were influencing the markers' marking performance such as the markers' knowledge of the assessment and marking process, the marking experience, the socioeconomic background and also the moderators' input.	- Marking national examinations - Marking performance - JSC maths assessment Qualified mathematics teachers Reform process Examination markers Mathematical content knowledge	Assessment
2009	Shemunyenge Taleiko Hamukwaya	An investigation into parental involvement in the learning of mathematics: a case study involving grade 5 san learners and their parents	The selected San parents were involved in some but limited school activities. Illiteracy may be one of the contributing factors of low or non-involvement of parents among the San community. Other factors which I found caused parents not to assist their children with homework was parents spending much of their time at the local cuca shops during the day until late in the evenings. The study also highlights possible strategies that can be carried out by teachers to encourage parental involvement in school activities.	- Parental involvement - Learning of mathematics - San learners - San parents - Illiteracy - Homework	Equity

2009	Christian N. Neshuku	An exploration of problems experienced in the interpretation of word problems by grade 12 learners	- The language in which the word problem was articulated did not make a difference. The performance in both English and Oshindonga tests was almost the same. - The findings also indicate that vocabulary, syntactic interpretation, semantic relationships, algebraic skills, and practical sense making in relation to real-life are all important for the successful interpretation and solving of word problems. - The study has provided valuable insights into aspects of the teacher education curriculum that need to be revisited in order to improve the training of teachers in teaching word problems.	- Interpretation of word problems - Grade 12 learners - Language: English and Oshindonga - Teacher education curriculum - The training of teachers - Teaching word problems	Learning Teaching
2010	Loide Ndakondjelwa Kapenda	The teaching of Mathematics in Multigrade classrooms at the Upper Primary phase in selected Namibian schools.	- Teachers mostly use their monograde pedagogical knowledge, resulting in using quasi-monograde with a common timetable approach when teaching mathematics in Multigrade settings. - Although learners have access to the common mathematics syllabus, the quality of teaching the subject in Multigrade classrooms seems to be affected due to the lack of teacher training in Multigrade teaching. - Also, equity and democracy need to be considered more than it currently is in terms of resource distribution to Multigrade schools. - Good practice of multigrade teaching existed in building on lower grade competencies, introducing lessons with common activities, as well as the concentration on lower grades which make learners independent. - Insufficient time, lack of knowledge in multigrade and curriculum knowledge in particular seem to challenge teachers and learners. - Multigrade teachers need to be part of curriculum development for them to master the syllabus. - These teachers will assist in developing multigrade resources for integration, contextualisation and more enrichment activities for high achievers.	- Teaching of Mathematics - Multigrade classrooms - Pedagogical knowledge - Upper Primary Phase - Teachers' experiences - Teachers' teaching methods	Teaching
2010	Albertina Ndahambelel a Mwandingi	An investigation of grade 11 learners' mathematical preparedness in a selected Namibian school a case study	- Diagnostic testing can prove to be useful in assessing learners' mathematical preparedness by identifying learners' areas of weakness, which have hindered their mathematics learning and performance. - Taking the results of a diagnostic test into consideration could help teachers cater for their learners who need remediation classes as early as possible before extending the mathematics curriculum. - Setting and using diagnostic testing requires careful consideration.	- Assessing learners' mathematical preparedness - Diagnostic testing	Learning/ equity/assessment

2011	Gerhard Ndafenongo	An investigation into how cell phones can be used in the teaching of mathematics using VITALmaths video clips: A case study of 2 schools in Grahamstown, South Africa.	Cell phones can be a used to support teaching and learning in the classroom, particularly in under-resourced schools. The use of VITALmaths video clips as mathematical content, and cell phones as a vehicle of delivery, enhanced active participation and concentration, sped up lessons, encouraged collaboration as well as interaction and hands-on exploration, and promoted both student autonomy as well as teacher enrichment.	- Using cell phones to teach mathematics - VITALmaths video clips -	Technology Teaching
2012	Beata Lididimikeni Dongwi	Mathematics teachers' experiences of designing and implementing a Circle Geometry Teaching Programme using the van Hiele Phases of Instruction as a conceptual framework: A Namibian case study.	Firstly, all three participating mathematics teachers used and implemented all the five van Hiele phases of instruction in their lessons I observed. Secondly, the teachers navigated quite freely from one phase of instruction to the next, but also returned to the earlier phases for clarification and reinforcement in their teaching. Thirdly, the teachers saw the phases of instruction as a good pedagogical tool or template for planning and presenting lessons. Fourthly, the majority of the learners followed the instructions and seemed to obtain the answers faster than expected.	Experiences of mathematics teachers Circle Geometry Teaching Programme The van Hiele Phases of Instruction	Teaching
2012	Reginald Kaleke Lipinge	An investigation into the perceptions of the first year mathematics students towards the alternative mode intervention: UNAM case study	The students identified mathematical proficiency as the central element to their learning, and pedagogical knowledge and exploratory talk were critical aspects of good teaching in the mathematical intervention programme.	- Lowest attainers - UNAM first year students - Mathematics proficiency - Intervention - Bridging-gap - Transition - Perceptions - Exploratory talk	Equity
2012	Daniel F. Junius	How do teachers characterise their teaching for conceptual understanding and procedural fluency? A case study of two teachers.	Both teachers' claims are substantiated and each teacher was consistent in her claimed approach. Each teacher's practice came about as an evolutionary process over an extended period of time. Peer support and sharing of practices contribute positively towards the improvement of the teaching practices.	- Teaching mathematics - Conceptual understanding - Procedural fluency - Pedagogic approaches	Teaching

2012	Tobias Munyaradzi Dzambara	An analysis of the distribution and use of teaching aids in mathematics in selected Windhoek secondary schools	The majority of teachers at secondary schools in Windhoek have a positive attitude towards the importance and role of teaching aids in Mathematics, seeing them as promoters of hands-on engagement, visual reasoning, active participation and motivation amongst learners. However, in some instances schools are under-resourced with respect to certain types of teaching aids, specifically graph boards, geoboards, geometric models and computers. There is a need for appropriate in-school support on the use of teaching aids was also identified.	Types of mathematics teaching aids usage of mathematics teaching aids Source of mathematics teaching aids Teachers' perceptions towards teaching aids	Curriculum/ Equity
2012	Linea Beatty Joel	Case study: using visual representations to enhance conceptual knowledge of division in mathematics.	Manipulatives and iconic visualization enhanced learning, and this could be achieved through scaffolding using a questioning approach. Manipulatives and iconic visualization need to be properly planned and used, and integrated with questioning to achieve procedural and conceptual knowledge	Procedural and conceptual knowledge of mathematics Using visual representations Manipulatives and iconic visualization Using manipulatives and visuals in teaching maths Teaching and learning Partitive and quotitive division	Learning Teaching
2012	Ndamononghenda Vatilifa	An investigation into understanding the experiences of the level 5-7 student teachers when teaching fractions in primary schools in Namibia: a case study	Student teachers viewed mathematics, specifically fractions, as just about doing calculations, doing drill and practice as in this way learners' understanding of fractions is enhanced. The importance of using rules and procedures was emphasized as paving the way to mastering fractions. Student teachers employed different teaching approaches when they considered learners' prior knowledge. Some student teachers misinterpreted the learner-centred approach in terms of group work and class discussion in their teaching of fractions. Some student teachers had an understanding of fractions as they managed to redirect their learners from applying some fraction misconceptions. Due to lack of understanding most of the participants experienced fear and anxiety in their fraction teaching; attempted an approach then reverted to old practices used in schools; taught fractions as symbolic representations where no meaning was involved; used incorrect terminologies such as '1 over 4' or '1 out of 4' instead of a 'quarter' or 'one-fourth'. Some student teachers viewed a fraction as a pair of two different whole numbers and can be broken apart.	Student teachers Teaching of fractions Teaching approaches	Teaching

2012	Ngola-Kazumba Maria	An investigation on how learners may use multiple representations in a social interaction to promote learning of percentages and fractions: A case study	The effective use of multiple representations helped learners learn the concept of percentages and fractions better. Learners were able to look at representations in useful ways; Multiple representations made some aspects of the concept clear; and multiple representations enabled learners to correct errors. Through the interaction between the teacher and learners, the following was found: all the learners changed words to change focus; learners made links between multiple representations; the learners deepened their concepts of percentages and fractions; learners could convert between fractions using multiple representations; learners could work out percentages of a quantity; and learners could express one quantity as a percentage of another. Through the interaction between learners and learners all learners could identify more equivalent fractions of an initial fraction which was given to them; and they could increase and decrease a quantity by a given percentage.	- Multiple representations: real world, written symbols, spoken symbols, diagrams and manipulatives - Social interaction - Learning of percentages and fractions - Teaching and learning programme - Learners understanding and feelings	Learning
2014	Loide M. Amupolo	An investigation into the nature of mathematical connections selected grade 7 teachers make when teaching fractions: a Namibian case study	Teachers made use of all the different types of connections as per Businkas's framework. The frequency of occurrence showed that Instruction-Oriented Connection and Multiple Representation connections topped the list of connections used. Teachers pointed out that connections to prior knowledge and making multiple representations were most significant, as they related to learners' existing knowledge and pointed to different ways of solving a problem. The teachers were, however, not familiar with the other connections identified as this was their first experience of interrogating connections. They, however, agreed on the importance of making those connections.	- Making connection in teaching mathematics - Types of connection - Instruction-oriented and Multiple representation - Conceptual understanding - Learning for understanding	Teaching Learning
2014	Ester Ndahekomwe nyo Kanyanda	An investigation into the nature of mathematics connections used by selected grade 11 teachers when teaching algebra: a case study	It was found that, even though teachers were not aware of the concept of mathematical connections before our interactions, there was strong evidence of connections being made and used in their lessons. The two types of connections that were used most frequently (24.1% each) were procedural and instruction-oriented connections respectively. Part-whole relationships connections were used the least with a frequency of 12%. All three teachers agreed that they needed to make more connections when teaching The study makes recommendations to encourage the continuous use of connections in teaching mathematics.	- Making connection in teaching mathematics - Procedural and instruction-oriented connections - Part-whole relationships connections	Teaching

2014	Saima Namupa Ihonya	A comparison of grade 10 mathematics classroom-based test items and the end-of-year national examinations, using Stein's framework of cognitive demands: a Namibian case study	- The findings of this study revealed that there was no substantial difference in the distribution of the levels of cognitive demand in both tests and national examinations items. - However, mainly tasks requiring only procedures without connections dominated the tests and the examinations. - The number of higher level tasks in both tests and examinations analysed was low. - There was no single task coded at cognitive demand level 4 in any of the teachers' tests. - Only 2% of tasks could be classified at level 4 in the examination items. - Since tests and examinations assess the same learning objectives from the syllabus, most of the test items set by teachers were extracted from the national examinations question papers. - The paper recommends that more tasks at a higher level category need to be included in assessment tasks to promote critical thinking amongst learners.	- Nature of tasks - Classroom-based test items - End-of-year national examinations - Stein's framework of cognitive demand	Assessment
2014	Ismael Shapange	An investigation into the types of classroom tasks Senior Secondary School (grade 11 and 12) mathematics teachers give to their learners: a case study.	- The study revealed that the participating teachers provided a nearly equal amount of lower level cognitive tasks and higher level cognitive tasks. - It further revealed several factors that influence teachers when selecting the types of tasks they give to their learners. - These factors include curriculum requirements, types of learners and their experiences, and learners' contexts.	- Types and nature of mathematics - Level of cognitive tasks	Assessment
2014	Julia Iiyambo	Investigating teachers' experiences of using multiple representations to teach fractions for conceptual understanding in 'grades 5-7': A Namibian case study	- Teachers who participated in the focus group workshop worked positively to develop their use of multiple representations to teach fractions. - They made sense of fractions and were able to look at representations in different ways to develop the meaning and concepts of fractions. - Teachers developed an understanding of working with multiple representations and were able to make connections among concepts and the use of concrete representations. - Teachers also developed their lesson plans effectively to involve a variety of teaching methods and multiple representations, despite the limited time available to them. - Teachers used different modes of representation to improve learner engagement in learning activities. - Lastly, teachers used multiple representations to teach in ways that improved the learners' conception of fractions.	- Teachers' experiences - Multiple representation in teaching: Mathematical symbols, Descriptive written words, Pictorial representations, Manipulations, Concrete reality, Oral representations, Experience-based representations - Videos or power point presentations - Teaching of fractions for conceptual understanding - Make connections	Teaching/ Equity

2016	Brian S. Kabuku	An analysis of selected grade 11 learners' interactions with geometry tasks using visualization processes: A case study in Namibia	- The use of visualisations facilitated meaningful learning when learners made use of these to develop and scaffold their conceptual understanding. - Most learners used visualisation processes fairly to very accurately when solving geometry problems - Used visualisation processes by using sketches and diagrams that transformed a mathematical problem pictorially, connected their thinking to previous knowledge and experience, clarified the algebraic task and assisted them to understand the spatial relationships within each task.	- Nature and role of visualisation processes - Visualization processes - Geometry Visualisation Tasks - Learners 'thinking processes' -	Learning
2016	Erasmus Mwiikeni	An analysis of how GeoGebra can be used as a visualisation tool by selected teachers to develop conceptual understanding of the properties of geometric shapes in grade 9 learners: a case study in Namibia	GeoGebra can indeed be used effectively as a teaching tool to teach for conceptual understanding in mathematics.	- GeoGebra - Visualisation tool - Use of dynamic visuals - Using multiple representations - Image generation - Image transformation - Make connections - Using visuals to justify mathematics ideas. - Properties of geometric - Angles properties	Technology Teaching Learning
2016	Selma Ndilipomwen e Nghifimule	An analysis of the nature of visualisation objects in three Namibian grade 9 mathematics textbooks: a case study in Namibia	Most of the VOs used in the selected textbooks align well with the mathematical content. The VOs can help make abstract ideas concrete, stimulate learning, simplify and clarify written texts. VOs can be used as a tool for reasoning and an instrument for problem solving. Some of the VOs used are not self-explanatory; they are vague, unfamiliar and confusing, leading to misinterpretations by some learners. Some of the learners found it difficult to interpret VOs on their own without the help of the teacher.	- Nature of visualisation objects - Mathematics textbooks - Learning of mathematical concepts - $y=mx+c$ to success, - Maths for Life 9 - Discover Mathematics 9 - The type of VOs, - the roles of VOs, - the relation of VOs to mathematical content, - the relation of VOs to reality, - and the VOs properties	Curriculum
2016	Joseane Josef	An analysis of visualization processes used by selected Grade 11 and 12 learners when solving algebraic problems: A Namibian case study.	- Learners used visualisations in all their problem-solving processes. - These visualisations were used for different purposes such as starting points, for illustrative purposes, as organizational tools and as simplification tools. - Visualisations as starting points were used when the problem was wordy and had lengthy descriptions and explanations. - Illustrative visualisations enabled learners to articulate in their own way mathematical notations, mathematical equations and expressions that they then used to solve the problem. Organizational pictures provided a useful structural framework for solving the problems.	- Visualization Processes - Grade 11 and 12 learners - Solving Algebraic Visualisation Tasks - Algebraic problems - Selected learners - Mathematics performance	Equity

2016	Simon Albin	Investigating the use of models to develop grade 8 learners' conceptual understanding of and procedural fluency with fractions	- These learners displayed conceptual and procedural difficulties in their engagement with fraction models and fraction symbols, before the teaching intervention. - These learners read fractions using inappropriate names; and learners did not identify the whole unit in the models and therefore identified fractions represented by the fraction models using different forms of inappropriate fraction symbols. - These learners compared and ordered fractions inappropriately using the sizes of the numerators and denominators separately; and learners used the lowest common denominator method inappropriately for adding fractions with different denominators. - The research also suggested conceptual and procedural changes in learners' conceptual understanding of and procedural fluency with fractions and that the intervention seemed to help learners to engage better with fraction models and fraction symbols. - Conceptually, the findings suggested that the intervention using area models and number lines, seemed to help these learners to read fractions using appropriate names; to identify the whole unit in the fraction models and to develop a sense of the size of fractions in relation to one whole unit. - Procedurally, the learners compared and ordered fractions appropriately using either equal fraction bars, equal number lines, benchmarking or rules for comparing and ordering fractions with the same numerator or denominator; and learners used equal fraction bars to visually represent the lowest common denominator method and to recognise that only equally sized units can be counted together. - This	- Learners' conceptual understanding - Learners' procedural fluency with fractions - Fraction models - Fraction symbols	Equity
2017	Gottfried Mbundu Muhembo	An analysis of how visualisation processes can be used by teachers participating in an intervention programme to teach for conceptual understanding of geometry	- This study revealed that the participant used visualisation processes in most of their lessons accurately in line with the requirements of the grade 8 mathematics syllabi. - The visualisation processes were used through designed visual materials, posters and through the use of geometrical objects such as chalkboard ruler, protractor and compass. - The results from this study also confirmed that visualisation processes can be a powerful instructional tool for enhancing learners' conceptual understanding of geometry.	- Visualisation processes - Teach for conceptual understanding - Geometry - Learning mathematics through visualisation	Teaching/Equity
2017	Gaus Tshithigona	An investigation into teaching mathematics using a visualisation approach to decontextualize indigenous knowledge	- Most teachers in the Oshana region have an understanding of the effective use of visualisation-IK approaches. - Visualisation- IK approaches are mostly used in grades 4 to 7 mathematics classrooms. - Most of the visualisation approaches that teachers employed aligned well with the curriculum and promoted conceptual understanding in the teaching of mathematics.	- Visualisation as a teaching approach - Teaching of mathematics - Enhancing conceptual understanding - IK approaches in teaching	Teaching/Equity

2018	Aune Kashikuka Katenda	Investigating how the use of visual models can enhance the teaching of common fractions for conceptual understanding to grade 8 learners.	- Visualising fractions is one of the methods that can improve both teaching and learning. - Visual models improve learners' motivation, enhances understanding of fractions and encourages full participation of learners in the lesson.	Visual models in teaching fractions Area model, number line and the set models	Teaching
2018	Dietlinde Nelao Namakalu	An analysis of the roles and functions of teachers' gestures as visualisation tools in the teaching of mathematics at the junior primary phase (grades 0 –3)	- The participating teachers incorporated a variety of gestures into their lessons and used them strategically. - According to the teachers, gestures made the lessons interesting and encouraged active participation of the learners in the lessons. - The teachers also revealed that gestures assist in explaining mathematical concepts and thus affected the learners' understanding positively. - This study strongly suggests that the usefulness and efficacy of employing gestures as visualisation tools in mathematics education should be strategically harnessed	Interactions between learners and teachers Gesture Teaching of mathematics	Teaching
2018	Ben Muyambango Munichinga	A critical analysis of selected teachers' perceptions and experiences of the role that visualisation processes play in their van Hiele level 1 teaching to migrate their learners to the next van Hiele level.	- Grade 8 learners who participated in the study were operating at levels lower than expected of pupils at their stage of schooling. - Visualisation processes and the Van Hiele phases are effective when used in geometry lessons to migrate learners from lower Van Hiele levels to higher. - For teachers in the same circuit, partnership and planning of difficult topics on an agreed regular basis is recommended. - When planning lessons teachers are encouraged to take advantage of the Van Hiele phases of instructions. - This study thus recommends the incorporation of visualisation strategies of teaching geometry in particular at primary and lower secondary levels. - Mathematics teachers are further encouraged to design visual materials such as Geoboards to use for every topic in geometry. - Such visual materials should be carefully developed and evaluated to ensure that their use in the classroom is effectively linked to concepts under discussion in a given lesson.	Visualisation processes and Van Hiele phases of instructions in their teaching . Geoboards as a visualisation tool Teaching geometry	Equity/Teaching
2018	Given Kahale Matengu	An analysis of how the use of geoboards as visualisation tools can be utilised in the teaching of quadrilaterals	- Geoboards were very useful in demonstrating the visual representations of the properties of quadrilaterals in a cheap and yet novel way in the selected teachers' classes. - The use of Geoboards by the selected teachers effectively fostered visualisation processes such as concrete pictorial imagery, dynamic imagery, perceptual apprehension, sequential apprehension, discursive apprehension and operative apprehension. - Geoboards enabled the selected teachers to structure and teach their lessons in a well-planned manner according to the Van Hiele phases, although it was difficult for them to adhere strictly to the hierarchy of the phases.	- Geoboards - Visualization Processes - Van Hiele phases - Teaching geometry - Effective use of manipulatives in the teaching of mathematics	Teaching

2018	Enos Kalua	A design experiment exploring the influence of visual and kinaesthetic tools in learning grade 8 linear algebra in a Namibian secondary school	- The study revealed the use of diagrams helped the learners in understanding the separation of variable and constant terms when simplifying expressions through addition and/or subtraction. - The study also revealed that the use of an expansion box was useful for the learners in understanding expansion of brackets in expressions with more than one term. - Regarding the use of the balance method, the study showed that learners were already able to solve linear equations by the transfer method, hence, the balance method was not necessary.	- Visual and kinaesthetic tools - Learning - Linear algebra - Help learners develop meaningful understanding	Learning
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