

UNIVERSITY OF KWAZULU-NATAL

The impact of CASME support to schools to improve results in mathematics at
Umlazi District, KZN province in South Africa

Henry Mbongiseni Gumede

212547262

A dissertation submitted in partial fulfilment of the requirements for the degree of
Masters of Business Administration

College of Law and Management Studies
Graduate School of Business & Leadership

Supervisor: Mr Christopher Chikandiwa

Year of submission

2015

DECLARATION

I, Henry Mbongiseni Gumede, hereby declare that the work in this dissertation is my original work and that all references cited in this dissertation are properly recognised and acknowledged.

Student signature

Student No: 212547262

ACKNOWLEDGEMENTS

I wish to express my sincere appreciation and gratitude to the following individuals, without whose assistance this study would not have been completed:

- ✚ My beloved wife, Zenzile Gumede, and kids for their staunch support all the way through and for being the source of strength and faith all the time.
- ✚ Centre for Advancement of Science and Mathematics Education (CASME) management and staff for corporate insight and support.
- ✚ All respondents to my questionnaire for their time and willingness to give their honest opinions.
- ✚ MBA group created from the first year for encouraging one another all the time and instilling the correct attitude, that together we can do more!
- ✚ My supervisor, Mr C. Chikandiwa, for being meticulously critical in my work and for always encouraging me when I seemed depressed and on the verge of losing hope. He always said, "Don't worry, Mr Gumede, we will win in the end. Keep writing!"
- ✚ My colleague, Sizwe Khumalo, for data capturing in Microsoft Office Excel.
- ✚ My statistician, Mokhulu Matshika, for high-level data analysis.
- ✚ All supportive friends, especially M.C. Zibane and B.C. Gumede.

ABSTRACT

Mathematics education has become a centre of attention in the Republic of South Africa (SA), with all phases of formal schooling performing poorly in all international and local assessments in the recent past. This led to a moratorium in international assessments participation called for by the then Minister of Education, Naledi Pandor, in 2011. This then made mathematics education a concern for every South African. Non-governmental organisations (NGOs) have projected themselves as having solutions to this challenge of poor performance in mathematics by South African pupils across all phases. The aim of this study was to determine the impact of one such NGO, the Centre for Advancement of Science and Mathematics Education (CASME). CASME is 29 years old to date and rolls out a number of projects funded by various corporations with vested interest in education in the hope of improving mathematics achievements in SA. This study seeks to investigate whether CASME makes a difference or not. The study was conducted in the Umlazi District of the KZN DBE. A quantitative research method was used in the study and the participants were CASME, Umlazi District Officials, Principals or Deputy Principals of previous and current CASME project schools, and mathematics teachers and School Governing Body members of previous and current CASME project schools. A sample of 20 primary and 20 high schools was selected using stratified sampling. A questionnaire was distributed to a total of 200 respondents and 164 were completed and returned. The research found that CASME impacted positively on mathematics teachers at CASME project schools of Umlazi District. There was sufficient consensus from the stakeholders that they all noticed positive teacher behaviour and good practices after project mathematics teachers had undergone various intervention programmes rolled out by CASME. The results of this study challenge established research institutions to undertake more studies on the work of NGOs in order to highlight their contribution to the societal issue of poor performance in mathematics by South African pupils. Although CASME was applauded for its work with mathematics teachers in its projects, it remains a fact that the targeted district of this study has challenges of underperformance in mathematics. This means that more still has to be done to help the situation and to assist the Government of the Republic of SA to accomplish some of its goals in the Schooling 2025.

TABLE OF CONTENTS

DECLARATION	ii
ACKNOWLEDGEMENTS	iii
ABSTRACT	iv
CHAPTER 1: INTRODUCTION TO THE RESEARCH	1
1.1 Introduction	1
1.2 Background	1
1.3 Focus of the study	2
1.4 Problem statement	3
1.5 Research questions	3
1.6 Objectives of the research	4
1.7 Limitations of the study	4
1.8 Summary	5
1.9 Dissertation outline	5
CHAPTER 2: LITERATURE REVIEW	7
2.1 Introduction	7
2.2 Models to assess training effectiveness	7
2.2.1 The Kirkpatrick model of evaluating training effectiveness	8
2.2.1.1 Level 1: Reaction	9
2.2.1.2 Level 2: Learning	9
2.2.1.3 Level 3: Transfer	11
2.2.1.4 Level 4: Results	11
2.2.2 Kaufman's five-level model of evaluation	12
2.2.3 The Kirkpatrick-Philip's Model	14
2.2.4 State of affairs in SA with regard to mathematics attainment	16
2.2.4.1 Impact of professional development and training of mathematics teachers	17
2.2.4.2 Models to improve mathematics achievements	18
2.2.4.3 Impact of poor mathematics achievements on essential skills in SA	19
2.2.4.4 The game of numbers in South African pupil performance	19
2.2.4.5 Influence of safety at school in mathematics performance	20
2.2.4.6 Availability of resources in the teaching and learning of mathematics in South African schools	21
2.2.4.7 Averages of South African schools in TIMSS assessment	21

2.2.4.8	State of mathematics achievements in comparative countries	21
2.2.4.9	Teaching practices in mathematics classrooms in South African schools	22
2.2.5	Professional development of mathematics teachers	23
2.2.5.1	Developing basic mathematics skills	23
2.2.5.2	Materials used by projects	24
2.2.5.3	Mathematics curriculum coverage	24
CHAPTER 3:	RESEARCH METHODOLOGY.....	26
3.1	Introduction	26
3.2	Aim and objectives of the study.....	26
3.3	Participants and location of the study.....	27
3.4	Data collection strategies	28
3.5	Research design and methods.....	28
3.5.1	Construction of the instrument	28
3.5.2	Recruitment of study participants	29
3.5.3	Pre-testing and validation.....	29
3.5.4	Administration of the questionnaire	30
3.6	Analysis of the data	31
3.7	Summary.....	31
CHAPTER 4:	PRESENTATION OF RESULTS	33
4.1	Introduction	33
4.2	Views of mathematics teachers on various aspects of CASME's impact in Umlazi District.....	33
4.2.1	Possession of necessary documents for effective teaching and learning	33
4.2.2	Planning, preparation, assessment and feedback.....	35
4.2.3	Learning resources and methods	36
4.2.4	Frequency of written mathematics work in the classroom and outside the classroom.....	37
4.2.5	Adequacy of books, quality of books and honouring of the teaching time-table	38
4.2.6	Views of Umlazi District mathematics teachers on CASME's workshops and classroom support visits	39
4.3	Views of School Principals and Deputy Principals on the effectiveness of CASME's programmes in their schools.....	41
4.4	Role of SGBs in CASME-implemented projects in Umlazi District	43
4.5	View of Umlazi District Officials on the effectiveness of CASME's intervention in mathematics challenges of Umlazi District	44

4.6	Perspective of CASME on its projects rolled out in Umlazi District	47
4.7	Summary.....	49
CHAPTER 5:	DISCUSSION.....	50
5.1	Introduction	50
5.2	Mathematics project teachers' views on the impact of CASME in Umlazi District.....	50
5.3	Principals' and/or Deputy Principals' views on the impact of CASME in Umlazi District.....	56
5.4	SGBs' perceptions of the impact of CASME in Umlazi District.....	59
5.5	District Officials' views on the impact of CASME in Umlazi District	60
5.6	CASME's views on its impact in Umlazi District	63
5.7	Conclusion	66
5.8	Summary.....	66
CHAPTER 6:	Recommendations and conclusion.....	68
6.1	Introduction	68
6.2	Has the problem been solved?.....	68
6.3	Implications of the research	71
6.4	Recommendations to solve the research problem	72
6.5	Recommendations for future studies.....	72
6.6	Summary.....	73

LIST OF FIGURES

Figure 2.1:	How to evaluate training effectiveness	8
Figure 2.2:	Kaufman's five-level model of evaluating training effectiveness	12
Figure 2.3:	Kirkpatrick-Philip's Model	14
Figure 4.1:	Possession of necessary documents for effective teaching	34
Figure 4.2:	Planning, preparation, assessment and feedback	35
Figure 4.3:	Learning resources and methods of learning.....	36
Figure 4.4:	Frequency of writing mathematics	37
Figure 4.5:	Adequacy and quality of books used	38
Figure 4.6:	Impact of CASME as viewed by project mathematics teachers	39
Figure 4.7:	School Management Team's views on CASME's impact.....	42
Figure 4.8:	SGBs members' views on CASME's impact.....	43
Figure 4.9:	District Officials' views on CASME's impact	45
Figure 4.10:	CASME's views on its delivery of projects in Umlazi District.....	47

LIST OF ABBREVIATIONS

ANA	Annual National Assessment
CASME	Centre for Advancement of Science and Mathematics Education
CAPS	Curriculum and Assessment Policy Statements
CDE	Centre for Development Enterprise
DBE	Department of Basic Education
HOD	Head of Department
JET	Joint Education Trust
KZN	KwaZulu-Natal
NGO	Non-Governmental Organisation
NPO	Non-Profit Organisation
RNCS	Revised National Curriculum Statement
SA	South Africa
SACMEQ	Southern and Eastern African Consortium for Monitoring Education
SGB	School Governing Body
SLA	Service Level Agreement
SMT	School Management Team
TIMSS	Trends in International Mathematics and Science Study

CHAPTER 1: INTRODUCTION TO THE RESEARCH

1.1 Introduction

This chapter introduces the reason for the study. The chapter lays out the motive and focus of the study. It presents the problem statement and introduces the sequence of activities in the study. This further introduces the research question and presents the objectives and sub-questions of the research question. The study looks at the work of a non-profit organisation (NPO) called the Centre for Advancement of Science and Mathematics Education, hereinafter referred to as CASME. The study seeks to investigate the impact of this NPO in Umlazi District of the KwaZulu-Natal (KZN) Department of Basic Education (DBE). CASME conducts mathematics teacher development workshops and classroom support visits to mathematics teachers of its projects. This chapter, towards the end, cites the limitations noted and observed during the course of the study and ends with a summary of the chapter to sum up the introduction to this dissertation.

1.2 Background

Trends in International Mathematics and Science Study (TIMSS), a cross-national assessment body of the mathematics and science knowledge of Grade 4 and Grade 8 pupils, always placed the Republic of South Africa (SA) at the bottom of its list of merits for every assessment that SA participated in. The TIMSS was developed by the International Association for the Evaluation of Educational Achievement to allow participating nations to compare pupil educational achievements across borders of the world. The TIMSS was first administered in SA in 1995, and continued to be administered in 1999, 2002 and 2011. In all these assessments SA came at the bottom end of the order of merit for pupil achievements in mathematics – hence a stance to stop participation by the then Minister of Education, Naledi Pandor, and the institution of, first, National Systemic Evaluation and then what is now called Annual National Assessment (ANA), in specific critical grades of schooling. The ANA started at exit grades, i.e., 3, 6 and 9, in 2012, but other grades have been added over the years to make it compulsory up to Grade 9.

In the history of CASME no research has ever been done as a way of testing the effectiveness of its own theory of change. Therefore this study will benefit CASME a great deal in terms of obtaining feedback in the form of research with a holistic approach. The study has revealed interesting facts that both CASME and the DBE can use to strengthen the campaign to obtain better mathematics achievements in SA. The recent release of ANA results for the fourth term of 2014, with Grade 9 scoring an average of 11%, further confirms the challenge (DBE, 2014) – and further underscores the importance of the existence of NPOs such as CASME. It was therefore more than necessary that their work be put under such scrutiny as in the context of this research topic.

1.3 Focus of the study

The study investigated the effectiveness of CASME support to Umlazi District mathematics teachers. The focus of the study was to establish the best practices this NGO (non-governmental organisation) support provided where achievements have been improved, or to source reasons for the NGO's failure if this is found to have manifested itself. The study was intended to further benefit CASME, the DBE at Umlazi District level and the mathematics teachers of the district and the country at large by improving on the practices uncovered by the study.

This study does not use pupils' results as a measure of impact as most studies have done in similar research projects before. The pupils' results were, in this study, not viewed as more important than how teachers feel after being involved with CASME in a professional development discourse. However, it could not be ruled out that pupils' results were correlated to teacher competence, even though pupils' results were not used in that sense in this study. CASME of course intervenes with the view to improve teacher competence in this gateway subject and yield best pupils' results as a consequence. In terms of this study, however, pupils' results were only used to highlight the need for NGO interventions, not only at Umlazi District schools but in the whole of SA.

1.4 Problem statement

South African schools are ranked lowest in international studies in mathematics achievements (TIMSS, 2010). The mathematics achievements in all grades, through school-based and external assessments within the country, are very low. This has a negative effect on essential skills that are mainly grounded in mathematics (Joint Initiative for Priority Skills Acquisition, 2009). SA is currently lacking essential skills and that may have an economic drawback in the long run. For a good number of years now corporations with corporate social investment divisions have invested in mathematics teacher development projects all over the country. The country therefore expects to see a return on these investments in the form of best achievements in mathematics after projects have been rolled out.

This study sought to analyse whether CASME is impacting on the project's intended beneficiaries or not. The beneficiaries are project schools and mathematics teachers in these project schools. It would help the DBE strengthen its partnerships with NGOs if CASME had a good impact on teachers in Umlazi District. The DBE and the Government of the Republic of SA are in search of solutions to the plight of poor performance in this gateway subject. If the study revealed that the NGO's work does not impact positively on mathematics teachers' performance, the DBE would have to take a firm stance on permission and discontinue partnerships as that would mean they are wasting time for these teachers in the name of professional development. The study therefore attempts to answer the research questions outlined below.

1.5 Research questions

- How does CASME influence improvement in mathematics achievements in Umlazi District of the KZN DBE?
- What are good practices that CASME shares with the Umlazi District project teachers in order to improve their competence in the teaching of mathematics?
- How do critical stakeholders view CASME support in the project schools of Umlazi District?
- What are the main factors that cause poor performance in mathematics in Umlazi District schools?

1.6 Objectives of the research

- To assess the level of impact of CASME in improving mathematics achievements in Umlazi District of the KZN DBE.
- To identify practices that yield good pupil results in a mathematics teacher development project.
- To assess the impact of CASME's model of intervention at Umlazi District project schools.
- To investigate the underlying factors of poor pupil performance in mathematics in Umlazi District schools.

1.7 Limitations of the study

School Governing Body (SGB) members were hard to find as they, by nature of their involvement in schools, do not reside within the school during school hours. It was also a challenge to explain repeatedly to them what the study was about as well as its importance. Although SGBs displayed some awareness of the challenges of poor pupil achievements in mathematics, a solid understanding of why CASME worked closely with their school mathematics teachers was not discerned during the preliminary talk in most cases.

The second limitation of this study was attendance of Principals and District Officials at targeted meetings. It was also difficult to find District Officials in office, which made data collection with respect to these stakeholders a nail-biting exercise. However, credit is given to Subject Advisers, who all responded to the questionnaire and even tried to encourage another few District Officials to respond as well.

The last limitation of this study was use of the quantitative research method only. A mixture of quantitative and qualitative would have been best as no clear reasons were furnished for choices that needed explanation. It would benefit this study more if provision for explanation had been made. A number of questions in the questionnaire led to other questions, which would have been cleared up by respondents themselves spelling out answers if space had been provided.

Data analysis was restricted to Microsoft Office Excel after realisation that the GeoGebra software program would need more expertise and inputting of data to compute statistical summaries. However, Microsoft Excel proved to be adequate. Graphical figures are discussed in Chapters 4 and Chapter 5 of this dissertation.

1.8 Summary

It can be summarised that the research plan was clear but needed more careful thought on the part of getting SGBs on to understand the purpose of the study and the nature of the quantitative approach as the method of the study. While objectives and investigation questions were clear, not all stakeholders fully appreciated the reasons for undertaking research and that called for added time to explain things. Co-operation from all identified stakeholders in the research was good. Appreciation is due to all respondents for their time and honest opinions.

This chapter has unpacked the focus and objectives of the study. In the next chapter the focus is on available and supporting literature that scholars have researched. It discusses the models of training effectiveness that exist and also focuses on available literature on the state of mathematics performance in SA. CASME's intervention in Umlazi District is analysed in view of the available literature on these two aspects, i.e, training effectiveness and the state of mathematics performance in SA.

1.9 Dissertation outline

Chapter 1

This chapter introduces the study focus and objectives. The chapter articulates the problem statement and spells out what the study's limitations were. It introduces the whole dissertation and summarily maps out what each of the forthcoming chapters will entail.

Chapter 2

This chapter refers to the available literature to support the main question of this study. The literature review focuses on the effectiveness of training and explores a variety of models of training effectiveness. The review further considers the work of many scholars on the state of mathematics performance in South African schools.

Chapter 3

This chapter presents the methodology used to collect the data in an attempt to answer the main research question. It explains in detail how data were collected and discusses the method used to analyse the data. It explains how respondents were reached and how they will receive feedback on the outcomes of the study.

Chapter 4

This chapter reports all analysis of the collected data without discussing the meaning thereof. It lists raw results from the data capturing in graphical form for easy reading and interpretation. Questions are grouped in similar themes for efficiency and to further facilitate understanding.

Chapter 5

This chapter discusses the results shared in Chapter 4. It attempts to attach meaning to what was revealed by the study. It links opinions of scholars shared in Chapter 2 to what is revealed by the collected evidence from Umlazi District stakeholders who participated in the study.

Chapter 6

This chapter concludes the whole dissertation and tables recommendations for future studies that are related to the main research question. It rounds up the study findings and makes a conclusive statement in relation to the research question as to whether or not CASME makes an impact on Umlazi District in order to improve mathematics achievements across all the grades of formal schooling.

CHAPTER 2: LITERATURE REVIEW

2.1 Introduction

This chapter focuses mainly on two aspects, namely training effectiveness and the state of mathematics performance in SA. The review of literature first gives a view on how effectiveness of any training could be assessed by looking at available models of evaluating training effectiveness. The reason for tapping into that insight was precisely because CASME is about professional development, and professional development is closely related to training. The other reason was derived from the awareness that CASME gives teachers a pre-test which serves as a diagnostic test before the workshop starts, and gives the same teachers a post-test at the end of workshop. In this way, drawing upon literature on assessing training effectiveness became critical and relevant to the context of the research question.

The review looked at available findings on mathematics achievements in SA as there are no literature findings specific to Umlazi District of the KZN DBE mathematics teachers. Various authors were cited to get a sense of what impact the work of NGOs has had on the mathematics project teachers countrywide. The work of assessment bodies and research institutions like TIMSS, the Centre for Development Enterprise (CDE) and Southern and Eastern African Consortium for Monitoring Education Quality (SACMEQ) was also reviewed extensively to further qualify the problem statement of this dissertation.

2.2 Models to assess training effectiveness

There are various models that scholars have put together as means to assess training effectiveness. This study discusses some of these important models in line with the model of intervention of CASME. The study focuses on the impact of this NGO in Umlazi district with special focus on mathematics attainments in this district. The models reviewed in this chapter enables the researcher to make sound analysis and comparisons in chapter 4 in relation to the impact of CASME in Umlazi district.

2.2.1 The Kirkpatrick model of evaluating training effectiveness

According to Donald Kirkpatrick (1994), assessing training effectiveness encapsulates a four-level model. This model suggested that evaluation always began with level one, and then, as time and budgets allowed, moved sequentially to levels two, three and four. In this way, therefore, information from each prior level served as a base for the next level of evaluation. This implied that each successive level per se represented a more precise measure of the effectiveness of the training programme, while at the same time requiring a more rigorous and time-consuming analysis (Kirkpatrick, 2003).

Kirkpatrick's four level model for evaluating training effectiveness

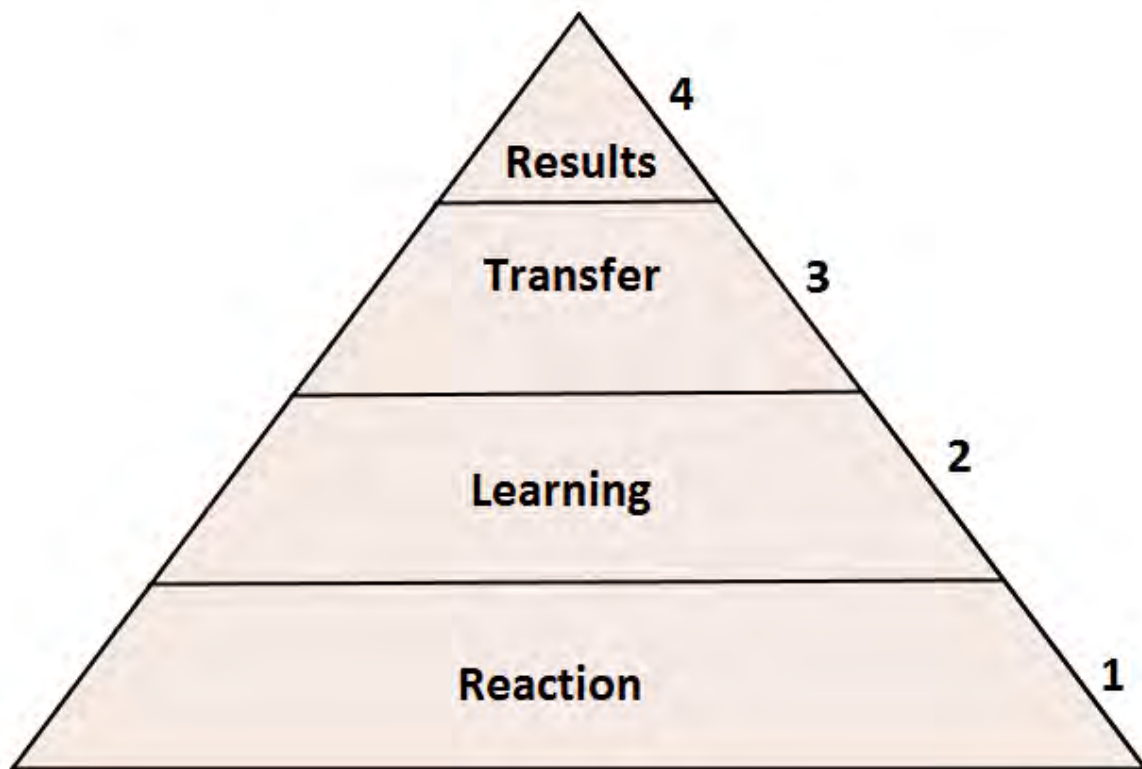


Figure 2.1. How to evaluate training effectiveness.

Source: Adopted from Kirkpatrick Model of Evaluating Training Effectiveness online, <http://www.busgurus.ca/media/pdf/the-kirkpatrick-evaluation-model-en.pdf>

To make sense of this diagram, the four levels as coined by Kirkpatrick (1994) are described briefly below.

2.2.1.1 Level 1: Reaction

Kirkpatrick (1994) suggested that evaluation at this level measured how participants in a training programme reacted to it. The attempt was to answer questions regarding the participants' perception of the training. It might give answers to the question as to whether or not the material was relevant to their work. At this level this type of evaluation was referred to as a 'smile sheet' by Kirkpatrick. This was probably because participants needed to show some reaction, whether positive or negative, to the training impact. Kirkpatrick (1994) suggested that every programme should, at least, be evaluated at this level to provide for the improvement of that training programme.

The participants' reactions had a lot of importance in relation to the next level of evaluation. Kirkpatrick (1994) further asserted that although a positive reaction did not guarantee learning, a negative reaction almost certainly reduced possibility of the next level of evaluation. This highlighted the importance of getting a feel of what the reaction of the participants was about training they had received. This level of training programme evaluation will form the basis of the arguments for or against the impact of CASME on mathematics teachers of Umlazi District in numerous ways, under the discussion of questionnaire results in Chapter 5.

2.2.1.2 Level 2: Learning

At this level the amount of learning that had occurred due to a training programme is assessed. This level of evaluation often used tests conducted before training (pre-tests) and after training (post-tests). CASME use a similar approach during workshops for project mathematics teachers. Assessing at this level moves the evaluation beyond participants' satisfaction and attempted to assess the extent to which participants had advanced in skills, knowledge, or attitude during the course of training. "Measurement at this level is more difficult and laborious than level one," states Kirkpatrick (2003, p. 18). Formal and informal testing, team assessment before the training (pre-test) and after training (post-test) were all measurement methods used to determine the amount of learning that had occurred. There is much relevance to the business of CASME in Kirkpatrick's assertions in his four-level model of evaluating effectiveness of training programmes.

In the spirit of this level of Kirkpatrick's model, it must first be mentioned that most schools in Umlazi District are in the category of Quintile 1 and 2. The reason for bringing in this aspect is that the following conclusions were made in the TIMSS report of 2011: "As expected, there was a relationship between the poverty index of the school and achievement in mathematics and science" (TIMSS, 2011: p.23) The report accentuated how Quintile 1 and 2 schools performed at similar achievement levels, lower than the achievement levels of the better-resourced Quintile 3, 4 and 5 schools. This was the best example of Level 2 evaluation in terms of Kirkpatrick's model. As was expected again, Quintile 5 schools achieved a much higher average achievement scores than the other quintiles.

The report further stated that independent schools were generally better resourced and, as a group, would be categorised closer to the public schools ranked at Quintile 5. The independent schools and Quintile 5 public schools scored 474 and 438 respectively for mathematics (TIMSS, 2011). These scores were very close to the TIMSS acceptable mean score of 500 as international benchmark performance. The expectation, therefore, is that schools that are characterised by underperformance and are of Quintile 1 and 2 classification in the whole country, need such supporting organisations as concluded by the TIMSS report.

Learning, therefore (as in the second stage of Kirkpatrick's model) is important in evaluating CASME's impact on mathematics teachers of Umlazi District. CASME invariably need to ascertain from the mathematics teachers they support whether learning has occurred or not after each and every support activity. It is public knowledge that CASME uses evaluation forms that compel teachers into making statements about how they feel after each workshop. This is further evidence that almost everyone agrees with Kirkpatrick that this stage of programme evaluation is extremely important – as it is in evaluating the impact of CASME workshops and classroom support, which is the focus of this study.

2.2.1.3 Level 3: Transfer

At this level the transfer that had taken place in participants' behaviour due to the training programme was measured. Newly acquired skills, knowledge or attitudes being used in the everyday environment of the participants were all evaluated at this level. It was the truest assessment of a programme's effectiveness for many trainers when it reached this level. However, measuring at this level was difficult as it was often impossible to predict when the change in behaviour occurred and thus required important decisions in terms of when to evaluate, how often to evaluate, and how to evaluate (Kirkpatrick & Kirkpatrick, 1994).

2.2.1.4 Level 4: Results

To explain this level well, an example of a business setting is used. Level 4 of evaluating effectiveness of training programmes attempted to assess training in terms of business results. For example, if sales transactions improved steadily after training for sales staff occurred, then it would be a good show of results as a consequence of training. This level measured the success of the programme in terms that managers and executives could understand. It was frequently thought of as the bottom line.

Business people would argue from a business and organisational perspective that this was the overall reason for training programmes, yet Level 4 results were not typically addressed. Determining results in financial terms was difficult to measure and was hard to link directly with training (Kirkpatrick, 2003). Kirkpatrick further explained that training was often seen as a costly overhead rather than an essential contributor to business success. Kirkpatrick added that while Chief Executive Officers might pay to commission it, deep down most of them might not believe that training can make a positive impact on the bottom line.

As outlined, these four levels would become the yardstick for investigating the impact of CASME in their project schools. All that CASME did with the project teachers or schools would be viewed in the light of these four levels of assessing effectiveness of training programmes as described by Kirkpatrick.

2.2.2 Kaufman's five-level model of evaluation

The core of this model is based on the Kirkpatrick approach, and it is a good model to use if one is used to using Kirkpatrick's levels of evaluation. It is a better model compared to Kirkpatrick's, if one wishes to make slight changes to the training evaluation tool. Figure 2.2 below sums up the five levels from Kaufman's point of view of evaluating training effectiveness (Kaufman, 2011).

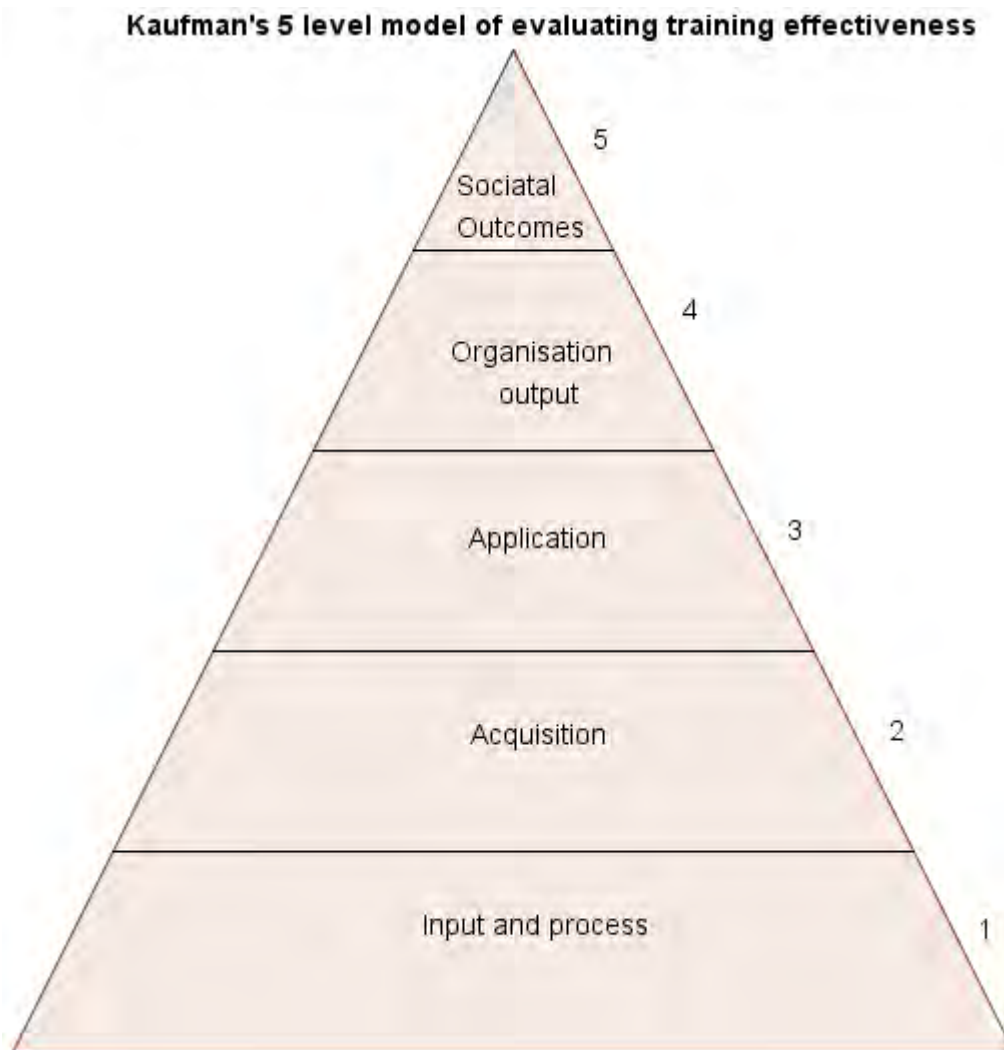


Figure 2.2. Kaufman's five-level model of evaluating training effectiveness.

Source: Adopted from Kaufman's five-level model online,
<http://www.busgurus.ca/media/pdf/the-kaufman-evaluation-model-en.pdf>

The five levels depicted above can be explained as suggested by Kaufman (2011) in the following manner:

1. **Input and process:** This is broken into two sub-parts, called Enabling and Reaction. Enabling is designed to evaluate the quality and availability of financial, physical, and resources. This level is an input to Reaction, which evaluates the efficiency and acceptability of the methods or processes in the training.
2. **Acquisition:** This level evaluates the competency and mastery of a test group or individual in a controlled setting.
3. **Application:** The purpose of this level is to evaluate the success of the group or individual based on how they are using content of the training programme.
4. **Organisation output:** This level's purpose is to evaluate the results of the contributions and payoffs of the entire organisation, as attributed to the training. Return on investment is one metric used to determine the overall success.
5. **Societal outcomes:** This level looks to see how the contributions to and from the end-user are impacted by the training. Some indicators of success that are investigated include responsiveness, consequences, and payoffs.

As can be seen, there are some similarities between Kaufman's model and Kirkpatrick's model, but Kaufman's model is also slightly different. There are also many other viable models for evaluating training effectiveness. The important thing is that one employs some degree of metrics gathering data for analyzing data when creating the training programme. It provides value to clients and allows one to further refine one's skills as training developers.

CASME operates at Umlazi District Office and delivers training in the form of workshops to mathematics teachers of the various projects across all phases. It is therefore relevant to use Kaufman's model to evaluate effectiveness of CASME workshops for mathematics teachers in this district.

2.2.3 The Kirkpatrick-Philip's Model

The diagram below shows how Philip integrated Kirkpatrick and Kaufman's work into one model referred to as Kirkpatrick-Philip's model. The model is discussed briefly below.

The Kirkpatrick-Philip's Model

ROI = Evaluating the return on investment

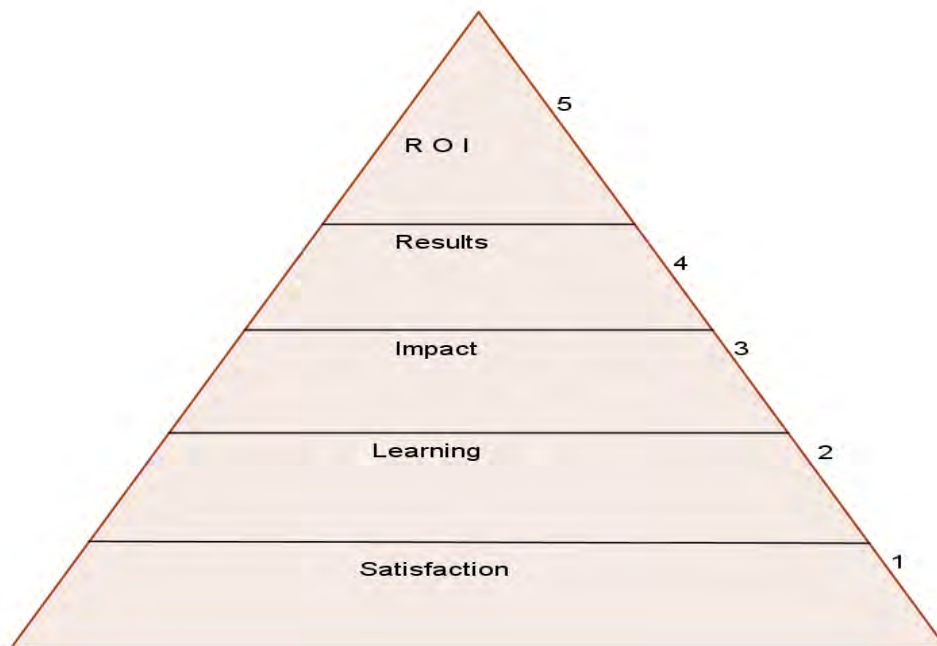


Figure 2.3: Kirkpatrick-Philip's Model

Source: Adopted from Kirkpatrick-Philip's Model online,
<http://www.busgurus.ca/media/pdf/the-kirkpatrick-phillips-evaluation-model-en.pdf>

The Phillips model measures training outcomes at five levels. The following provides a summary of the five levels.

Level 1 - Reaction, Satisfaction, and Planned Action: Level 1 measures participants' satisfaction with a program as well as their plans to use what they have learned. Although most organizations evaluate at Level 1 exclusively, it should be noted that this level of evaluation does not guarantee that participants have learned new skills or knowledge or will use them on the job.

Level 2 – Learning: Using tests, skill practices, role playing, simulations, group evaluations, and other assessment tools, level 2 evaluations assess how much participants have learned. Again, although it is useful to know that participants have absorbed the new skills and knowledge, a positive outcome here does not mean that participants will use the new learning when they are back on the job.

Level 3 - Behaviour, Application and Implementation: Level 3 evaluation assesses whether (and how much) participants applied the new knowledge and skills on the job. The extent to which the new learning is applied in the workplace (or changes behaviours) determines Level 3 success. Here too, it should be remembered, a favourable Level 3 evaluation does not guarantee that business outcomes will be positive.

Level 4 - Business Impact: Level 4 measures the extent to which business measures have improved after training. Typical Level 4 measures are output, quality, costs, and time. It is important to go beyond Level 4 business results, however, because even if the training program results in substantial business improvement, there is still a concern that the program's costs may outweigh its business benefits.

Level 5 - Return on Investment (ROI): ROI is the ultimate level of evaluation. It compares the monetary benefits from the program with the program costs. Although the ROI can be expressed in several ways, it is usually presented as a percentage or cost/benefit ratio. (Phillips 2005) The Phillips' model evolves from, and can be distinguished from, the earlier Kirkpatrick model by the adoption of return on investment to yield additional, critical insight. ROI allows decision makers to compare the ultimate value of a training investment with other potential investment opportunities.

2.2.4 State of affairs in SA with regard to mathematics attainment

To begin with, a review highlighting the education crisis in SA in broad strokes is made. Literature by a number of scholars in the mathematics education fraternity was reviewed. The *South African Journal in Education* stated (May, 2009) that the very low value for money, provided by the South African schooling system had become well known in the 20 years since the fall of apartheid. The journal further accentuated that in order to improve the quality of schooling in SA, which is far less clear, despite the activities of NGOs and donors, both international and local government must direct more resources towards improvement in mathematics achievements.

The starting assumption of this research topic was that weaknesses exist at every level of the system of basic education in SA (and hence Umlazi District), and that classroom, school and administrative structures all contribute to the crisis in formal schooling. Kriek and Grayson asserted in a 2009 paper that identifying the key problems which occurred at each of these levels was a prerequisite for designing more effective school improvement interventions. This background paints a bigger picture of how education challenges exist, in general, in SA. This then provides a good reason why this study was instituted, focusing on one aspect of many challenges, namely on the Impact of CASME in mathematics achievements in Umlazi District.

Kriek and Grayson (2009) stated that the evidence on which the analysis was based varied from strong, generalisable data derived from representative national surveys, to small-scale descriptive studies based on a handful of classrooms (Kriek & Grayson). "Much of the data, therefore, despite the ring of authenticity it may have for anyone who has spent time in South African schools and classrooms, requires verification before it can serve as the basis for a firm national picture." Needless to say, this illustrated the range of considerations which need to go into the design of any reform efforts by the South African national and provincial DBEs, notwithstanding Umlazi District in KZN Province.

This review is about the state of mathematics education in SA, which has become a cause for concern for concerned South Africans: "This situation can be attributed, in part, to many mathematics teachers' limited content knowledge, ineffective teaching approaches, and unprofessional attitudes" (Kriek & Grayson, 2009:p.58). This

assertion backs up the existence of CASME in a strong manner as having serious work to do. In the offerings of CASME, all aspects highlighted by Kriek and Grayson are covered. All CASME projects chiefly direct their resources to mathematics content knowledge and effective teaching approaches.

It was therefore important to track the impact of CASME to ascertain what worked to sustain it in every way possible for the betterment of mathematics achievements in the country. Umlazi District of KZN DBE is therefore a premise from which to move forward.

2.2.4.1 Impact of professional development and training of mathematics teachers

According to (Kahle, 2005) schools are only as good as their teachers, regardless of how high their standards are, how up-to-date their technology is, or how innovative their programmes are. This means that the work of CASME with their project schools needs to be exclusive and world class. In order for their schools to have good teachers, their theory of change had to work some magic. “Long-term, sustainable improvement of mathematics education must therefore focus on strengthening teachers,” state Kriek and Grayson (2008: p.61) There is clearly agreement between the two works in that the essence of learning discourse rests heavily in the hands of a teacher. Mathematics teachers of Umlazi District are therefore not immune to the challenges described by the two authors.

Although it is widely acknowledged that changes are needed, only limited information is available about the factors that contribute to effective mathematics professional development, as well as examples of programmes that lead to effective practice (Kyle Jr, 2005). This made this study important, as CASME was viewed as having know-how of these factors. This explains the quest in this dissertation to investigate the impact of CASME on Umlazi District teachers of mathematics across all phases of formal schooling.

2.2.4.2 Models to improve mathematics achievements

In addition to looking at South African models that try to improve mathematics achievements, programmes and models from several different countries were also reviewed. These programmes were PEEL (Australia), Discovery (United States of America (USA)), Cognitively Guided Instruction (USA) and the Japanese approach to professional development. These programmes were selected because they had a proven record of sustainability over the long term. Two models for professional development were also studied, namely, the models of Bell and Gilbert (New Zealand) and Loucks-Horsley, Hewson, Love and Stiles (USA). After studying these programmes and models, the following common features were identified: reflection on teachers' own practice; development of teachers' content knowledge; provision of infrastructure to support teachers; collaboration with fellow teachers and researchers; provision of opportunities to try out and discuss new teaching strategies; development of teachers as lifelong pupils; and recognition and development of teachers' beliefs. This, again, is what CASME is about in the teacher development space.

The TIMSS used the curriculum as the organising principle of how educational opportunities are provided to pupils. TIMSS asserted in its 2011 report that the curriculum model has three aspects: (i) the intended curriculum, (ii) the implemented curriculum, and (iii) the attained curriculum. The intended curriculum referred to the mathematics knowledge that society intended pupils to learn (the 2002 Revised National Curriculum Statement (RNCS) in SA); the implemented curriculum referred to how the educational system was organised (curriculum coverage), and the attained curriculum referred to what pupils had learnt (pupil achievement scores) (TIMSS, 2011). In this vein, CASME works with mathematics teachers of various projects, including Umlazi District project teachers, in ensuring that teachers receive adequate support on the three curriculum model aspects as espoused by TIMSS. This further supports the idea of investigating the impact of CASME support to mathematics teachers of Umlazi District project schools.

2.2.4.3 Impact of poor mathematics achievements on essential skills in SA

Mathematics a key area of knowledge for the development of individuals and the society and forms the basis of skills development in SA, the Joint Initiative for Priority Skills Acquisition emphasised (2009). The public and private sector, families and households have made major investments in mathematics improvement projects in a plethora of ways (Joint Initiative for Priority Skills Acquisition, 2009). Performance in this area was one of the key indicators to assess the performance of the ailing South African schooling system.

It was therefore imperative that the TIMSS allowed participating nations to compare pupil educational achievements across borders, and offered SA an opportunity to benchmark itself against other countries (Pandor, 2011). Through that comparison, SA was able to make a stance to withdraw its participation and put its house in order first when it came to mathematics achievements, as the performance was consistently poor in every year of international assessment. There is therefore a relationship between mathematics achievement and a shortage of essential skills in SA.

2.2.4.4 The game of numbers in South African pupil performance

It must be highlighted that for the period 1995–2002 the South African score distribution for mathematics, from the 5th to 95th percentile, was one of the widest of all countries that participated in the TIMSS. This showed the wide disparities in society and in schools, and was evident in the educational outcomes of the pupils in SA across all grades in the same TIMSS assessment. In 2011 the variance in the range of mathematics scores in SA decreased, suggesting that the country was moving towards more equitable educational outcomes. However, the achievement scores at the fifth percentile, generally those of pupils from low-income households and the most disadvantaged schools, increased between 2002 and 2011 (TIMSS, 2012).

In the 2011 TIMSS Grade 8 mathematics assessment, SA scored 30% in the content area of numbers, 30% in algebra, 20% in geometry and 20% in data handling (statistics and probability). The analysis of performance at cognitive levels of knowing was 35%, application was 40% and reasoning was 25% (TIMSS, 2011). During the period 2002–2011 the RNCS guided the instruction and learning of mathematics.

The TIMSS report further showed that a comparison of the TIMSS assessment framework and the South African intended curriculum revealed 94% mathematics coverage. Mathematics teachers reported that they had implemented 72% of the RNCS stipulated content. More than 85% of pupils were taught by teachers who reported they were 'well-prepared' to teach mathematics. This then pointed to the need for interventions, such as CASME's at Umlazi District, to try and support the mathematics teachers of SA.

2.2.4.5 Influence of safety at school in mathematics performance

Educationist Graeme Bloch wrote in *Three Futures for Education* that SA's schools were a disaster zone, meaning that instead of being a place for academic achievements and excellence, they had become zones of exclusion where many pupils felt unsafe because of bullying and violence (Bloch, 2009). That was how unsafe South African schools were. There was growing evidence that pupils perceived that lack of school safety adversely affected academic performance (CDE, 2009). In the TIMSS 2011 report Bloch's notion is supported that teachers and pupils reported on the perceived level of school safety, the degree of order at schools as well as the incidences of bullying as having an adverse effect on academic achievements.

The self-reported data in a DBE report indicated that 41% of Grade 9 pupils attended schools where principals rated discipline and safety as a 'moderate' problem, which is the lowest category in the index (DBE, 2011). In contrast, internationally 18% of the TIMSS pupils attended schools where principals rated discipline and safety as a 'moderate problem'. Only 21% of Grade 9 pupils were taught by mathematics teachers who rated their schools as 'safe and orderly' and 55% by teachers who rated their schools as 'somewhat safe and orderly'. The same report also espoused that 45% of pupils were taught by mathematics teachers who rated their schools as 'safe and orderly' and 49% as 'somewhat safe and orderly' internationally. Globally there was evidence that bullying in schools was on the rise and had a negative impact on educational achievements. In SA 75% of pupils reported experiencing some form of bullying, compared to the international average of 41% (TIMSS, 2011).

2.2.4.6 Availability of resources in the teaching and learning of mathematics in South African schools

Availability of resources is key to an environment which is conducive to learning of mathematics in schools (Joint Education Trust (JET), 2012). In the TIMSS survey principals were asked about the adequacy of school resources as well as resources to support mathematics teaching. According to the principals surveyed in SA in the TIMSS of 2011, 87% were 'somewhat affected' and 9% 'affected a lot' by a shortage of mathematics resources. In 2002 principals reported that 39% of mathematics pupils were affected by a 'low' availability of mathematics resources. Internationally, in 2011 7% of pupils were affected 'a lot' by a lack of resources for mathematics instruction (TIMSS, 2011).

2.2.4.7 Averages of South African schools in TIMSS assessment

The quantity and quality of performance at the higher ends provided an indicator of the pool of pupils who could progress to tertiary education and participate in careers grounded on mathematics. Although performing at the top level in SA, the ex-House of Assembly, Quintile 5 and independent schools were not globally competitive. The average scale scores for these groups were at or below the centre point of 500 in the TIMSS assessment. This performance of the top-end performers was analysed using the TIMSS international performance benchmarks and the changes tracked over time. From 2002 to 2011 the number of pupils scoring above the low benchmark of 400 more than doubled, from 10.5% to 24% (TIMSS, 2011). The number of those performing at the top end needed to improve in order to compare to international achievement profiles.

2.2.4.8 State of mathematics achievements in comparative countries

The poor performance of South African schools compared to those in both developed and developing countries has been established at primary level in mathematics and reading (Moloi P; Straus A, 2005); (Howie, 2007) and at secondary level in mathematics and science (Howie, 2001); (Reddy, 2006). The SACMEQ scores for mathematics at Grade 6 level starkly illustrate the point of poor performance in many African countries. In a JET report published in 2012 two important reasons are given for this. Firstly, SA was outperformed by eight surrounding countries, many of which

(including Mozambique, Kenya, Uganda and Tanzania) are much poorer, with gross domestic products in the order of one-tenth to one-fifth of SA's. This was a demonstration that while in general poverty was strongly associated with performance, many school systems achieved higher quality with far fewer resources than SA had (SACMEQ, 2006).

A second reason arose from an analysis of the mathematics scores by quintile. Even amongst the richest 20% of schools (Quintile 5), SA was outperformed by Mauritius and Kenya, and in all the other quintiles the South African mean scores fell below those of the SACMEQ all-country means (SACMEQ, 2006). Clearly a culture of complacency and low expectation permeated the entire South African system, including those schools which were privileged under apartheid and which continued to enjoy levels of resourcing well in excess of those which pertained in the majority of South African schools.

2.2.4.9 Teaching practices in mathematics classrooms in South African schools

Evaluation of one of the projects funded by the Zenex Foundation addressed the question of whether the knowledge and competencies that teachers gained from the training and support visits translated into improved classroom practice (JET, 2010). This evaluation pointed out that one of the positive classroom practices observed by the service providers in primary schools was that the teachers had introduced dedicated mental exercise periods. The report further alluded to the fact that at high school level teachers exposed pupils to a variety of mathematical activities. This was supported by the provision of practice materials for schools by the Zenex Foundation. This evaluation also revealed that at least 50% of primary school teachers and 55% of high school teachers were implementing the project's graded mathematics activities, which was aimed at improving the critical and mathematical thinking of pupils.

It was said in the report that the evaluators found that, in both cases, not enough assessment was being done and that, in general, General Education and Training pupils were writing less than three times per week. At Further Education and Training level the general assessment of mathematics teacher preparedness in the project schools was 74% (JET, 2011). However, the assessment showed that the content

knowledge of the teachers was much lower than their general preparedness. Only 27% of the mathematics teachers in the project schools were teaching curriculum content at the appropriate level. A further concern raised by the evaluation was the limited evidence of regular monitoring of pupils' written work by mathematics teachers. There was also huge variation amongst the schools in the content knowledge of mathematics teachers, variations which spoke to the complexity of designing effective teacher training interventions (Kirkpatrick, 2003).

2.2.5 Professional development of mathematics teachers

2.2.5.1 Developing basic mathematics skills

This review also looked at the summary findings of the Primary Mathematics Research Project, a DBE initiative in collaboration with JET, which started with an analysis of 7028 pupil test scripts, which had been collected from a number of project evaluations that had taken place between 1998 and 2004 in various provinces of SA. The analysis concluded that the fundamental cause of poor pupil performance in mathematics could be attributed to a failure of pupils to learn to calculate using established mathematical algorithms that require an understanding of the foundational knowledge (JET, 2004). The research showed that pupils – up to and including those in the Intermediate Phase – relied on counting in units to solve addition and subtraction problems. They also relied on repeated addition or subtraction to solve multiplication and division problems (Fleish, 2008).

Without a sound understanding of the number system and of basic arithmetic algorithms, pupils will fail to build a solid foundation for the acquisition of more advanced concepts (Fleish, 2008). In so doing, they entrench the knowledge deficits, which have been shown to have a profound influence on mathematics performance in senior grades (Alias, 2005). There is strong agreement between the findings of the JET and these two authors. Based on the findings, a set of materials was developed for classroom use which aimed to provide a good grounding in understanding numbers, operations and number relationships. Taking into account the fact that within each class there are pupils operating at one, two and even three grade levels below what is expected, the materials were developed for use with pupils at different performance levels. In so doing, they assisted teachers to deliver a more differentiated kind of teaching programme (DBE report: 2004).

2.2.5.2 Materials used by projects

According to Anderson and Martin (2007), materials which were informed by a specific theory of learning appeared to have a greater impact on pupil achievement. Materials which provided a structured programme for teachers had a greater impact on pupil achievement than less structured programmes (CASME, 2012). Training on materials had an effect on usage, particularly where the materials introduced teachers to new classroom methodologies and used new technologies (CASME, 2013). Utilisation of the materials is increased when there are clear linkages between the curriculum and the materials (Cho, 2010). There is clear-cut agreement among all authors in terms of project materials' usefulness to mathematics teachers and pupils. That has potential, therefore, to improve mathematics learning outcomes.

2.2.5.3 Mathematics curriculum coverage

Finally, this review looked at a striking feature of most South African classrooms – the slow pace at which teachers progress through the curriculum, sometimes spending a whole lesson talking about two or three maths problems. The BHP Billiton-funded project implemented by CASME in Gauteng reported that this slow pace resulted in low levels of curriculum coverage over the year, discernible through an examination of pupils' workbooks, which commonly contained very low volumes of written work (CASME, 2012). In a report by the Zenex Foundation it was reported that pupil exercise books often show between 10 and 20 A4 pages of mathematics written exercises completed over a school year (Zenex Foundation, 2010).

In another JET-funded project, called Khanyisa Education Support Programme, curriculum coverage in mathematics was assessed in the Khanyisa baseline study (Moyana: 2005). The study analysed the work done in all the exercise books of the best pupil in each class observed at all Khanyisa project schools. Topics covered were checked against those specified in the National Curriculum Statement. Observations were done and extrapolated to estimate coverage for the year.

This method of assessing coverage revealed that neither the extent of coverage nor the cognitive level at which the tasks identified in the work books were covered. The method of counting topics merely indicated whether these were addressed at all, at any level, for however brief a period, during the year and gave no indication as to the adequacy of coverage. It was discovered in this project that mathematics teachers

often struggled to cover the curriculum in full, highlighting the need for NGO intervention in the plight of mathematics achievements in SA.

2.3 Summary

Training and development is the critical aspect of professional development in any employment setting. Likewise, in the context of this research teacher development is key if pupil attainments are to improve in mathematics, not only in Umlazi District, as the focus location of this study, but in the whole of SA. This chapter discussed the useful Kirkpatrick model of training effectiveness assessment and then reviewed the work of many scholars and organisations with vested interest in the teaching and learning of mathematics. This included scholars reviewing the South African setting and a glimpse of findings in international countries in support of the views.

This review clearly painted the picture as to how deep the challenge of underperformance in mathematics is in SA across all phases of formal schooling. Government partners like the JET were cited to source their assessment views of the plight and, specifically, their project evaluators' findings were cited as to what works in the struggle to improve mathematics achievements in SA. Work of independent assessment bodies like the TIMSS and CDE was also cited to get a good picture of SA's rankings in such and similar assessments. All literature reviewed pointed to one fact: that there is a challenge and that organisations like CASME have a role to play in the fight against underperformance in mathematics in SA.

The next chapter will elucidate how the research will unfold and will give more meaning to the intentions of the research question. However, this review of the literature provides a basis for arguments in the spirit of the main research question, and confirm the importance of CASME as a professional development NPO for mathematics teachers across all phases of formal schooling. The targeted Umlazi District will form the centre of all forthcoming discussions, the results of which will be generalised for other DBE districts of KZN Province.

CHAPTER 3: RESEARCH METHODOLOGY

3.1 Introduction

This chapter gives details of who the participants in this study were and how data were collected, shedding light on the methodology used in the research. The chapter finally give details of how the questionnaire was administered and how data were analysed.

3.2 Aim and objectives of the study

The aim of the study was to investigate whether or not CASME has impacted on mathematics teachers of Umlazi District in both previous and current projects rolled out by CASME in this district.

There were four objectives of this study, namely:

- To assess the level of impact of CASME in improving mathematics achievements in Umlazi District of the KZN DBE.
- To identify practices that yield good pupil results in a mathematics teacher development project.
- To assess the impact of CASME's model of intervention at Umlazi District project schools.
- To investigate the underlying factors of poor pupil performance in mathematics in Umlazi District schools.

A questionnaire was designed with five sections for the five key respondent groupings identified for this study. Various stakeholders in relation to projects rolled out by CASME at Umlazi District were requested to respond to all questions in respective sections in the questionnaire.

The questionnaire was designed in such a way that the respondent would complete it easily by making crosses on the Likert scale rather than supplying long open-ended answer responses. This questionnaire was designed with that in mind to save time and maintain interest for all potential respondents.

3.3 Participants and location of the study

Participants in the study were critical stakeholders in projects rolled out that directly and indirectly benefit from the support that CASME offers and offered to Umlazi District schools. These stakeholders were: A. CASME, B. Umlazi District Officials, C. Principals or Deputy Principals, D. mathematics teachers from Umlazi project schools, and E. SGB members from Umlazi District project schools. These participants were chosen because they possessed valuable information that could assist in answering the main question of this study, namely whether CASME has an impact or not on mathematics achievements in the Umlazi District.

The greatest weight of questions was placed on mathematics teachers because they work directly with CASME and received direct benefit from professional development programmes of CASME. All other stakeholders did not directly receive capacitation from CASME but had indirectly worked with CASME in the common pursuit, whether as school managers or Subject Advisers, of the best informed mathematics teacher development programmes.

The study location of Umlazi District of the DBE in KZN Province of SA was targeted because of its history of an upward trajectory in mathematics results and the fact that CASME has had and still has a good number of projects in this district to improve pupil achievements in mathematics as a matter of national interest. In the eyes of the researcher, choosing Umlazi District as the study location was a matter of strategic importance; this district is in the peri-urban township and generally characterised by an inadequate supply of resources to teach and learn mathematics effectively. However, this location is one of the steadily improving districts in terms of overall results: the trajectory for the past five years is upwards –, but yet to be seen is an overall mathematics pass percentage exceeding 60% in Grade 12 results, let alone increasing the percentage of quality symbols (levels 6 and 7) within the overall pass percentage in Grade 12 mathematics (Education, 2011). All ANA average percentages are also atrociously low, and worse in Grade 9.

3.4 Data collection strategies

Data collection strategies included targeting meetings for District Officials, Principals and Deputy Principals, mathematics teacher workshops, the CASME office in Pinetown and setting appointments with Principals of schools to conduct questionnaires with SGBs. This was backed up by actual visits to schools where targeted respondents were not found in the scheduled meetings, to reach the expected number of responses as demanded by the minimal research requirements of this study. Questionnaires were completed and returned to the researcher on the same day to avoid delays and possible neglect of completion if left with respondents. Questionnaires were posted or faxed either to respondents or back to the researcher, as that might have presented a number of challenges in meeting the required number of respondents for the validity of the study.

Coincidentally, the Umlazi Association of Mathematics Educators of South Africa (AMESA) branch had an end-of-year meeting that included many of the CASME project teachers and Subject Advisers. The researcher requested a 15-minute slot to conduct the questionnaire with respondents that was granted by the AMESA branch committee. In addition, CASME hosted award ceremonies for Grades 3 to 7 in the South African Mathematics Olympiad for all CASME schools in Umlazi and Pinetown districts, where a slot was requested to distribute the questionnaire to Umlazi District project teachers who accompanied their pupils to the award ceremonies.

3.5 Research design and methods

This sub-heading discusses how the questionnaire was constructed and issues that were considered to eliminate bias and any possible negative influence. Issues of validity and reliability are also covered under this subheading.

3.5.1 Construction of the instrument

The questionnaire was first put together as one document with five sub-sections for the various key stakeholders in CASME-implemented projects. Instructions were constructed to direct stakeholders to the relevant sections, using the letters A to E and indicating the pages on which each section started. However, a consideration that the thickness of the questionnaire might scare the respondents necessitated separation of the sections into independent questionnaires, with all necessary background for the

study and instructions detailing how the respondents should complete the relevant questionnaire. Five different sectoral questionnaires were then constructed. This format resulted in each being section reasonably packaged and eliminated possible negative perceptions that it was long and would be time-consuming. This made respondents feel at ease with the questionnaire, only receiving relevant questions to respond to in their pack.

3.5.2 Recruitment of study participants

Recruitment of study participants was facilitated by the fact that the researcher used, in the main, meetings and other platforms that brought sectors of respondents together, such as Mathematics Olympiad competition that brought many teachers together in one venue, AMESA workshops and Principals' meetings called by the district officials. It must, however, be mentioned that SGBs posed a challenge, as they were not readily familiar with the researcher. Principals of schools played a significant role in establishing rapport between the researcher and SGB members who were identified by school managers to respond to the questionnaire.

A sample of 40 schools was selected from 113 schools that have participated in CASME-implemented projects. The selected schools included 20 primary schools and 20 high schools in Umlazi District. The selected schools were chosen using the wards that constitute the circuits, and the criterion used was to select at least five schools from each ward. Letters were sent via circuit managers to schools to recruit participants prior to the scheduled meetings and Mathematics Olympiad competitions.

3.5.3 Pre-testing and validation

Pre-testing and validation were completed with a group of teachers from Sisonke District at Ixopo High School in a meeting of mathematics teachers called by Subject Advisers. These teachers were CASME project teachers from the said district and were not part of the study. The purpose was to test if questions were clear and unambiguous. The researcher made it clear that teachers could ask questions if anything was unclear, and that notes would be taken of what questions were asked in order to institute changes to the questions and to try to rephrase ambiguity where this manifested.

Only one Principal and the Subject Adviser were in attendance at this meeting. Therefore validation was somewhat of a challenge to confirm with only one respondent from these two important stakeholder sectors. Unfortunately no respondents were available to be pre-tested from other stakeholder sectors, such as CASME and SGBs. However, it would not make sense to pre-test CASME, having to administer this same questionnaire at a later stage with the same respondents. That could, in some ways, affect the research results negatively.

Analysing mathematics teacher responses from the Ixopo High School group showed no ambiguity in the questions, and very few questions were asked during administration of the questionnaire. Those few questions which were affected were changed accordingly in the final set of questions for mathematics teachers in the questionnaire. There were no questions from the Principal and the Subject Adviser who completed the pre-testing questionnaires and therefore no changes were effected consequent to the pre-testing session at Ixopo.

In view of these facts, an assumption was made that the questionnaire was clear, unambiguous and respondent-friendly. Except for SGB members who needed interpretation in their mother tongue, all other sector respondents understood English well and did not have challenges understanding the questions. It is therefore assumed that the questionnaire was valid and therefore solicited valid data from which to make credible generalisations and conclusions in relation to objectives and the main question of this study.

3.5.4 Administration of the questionnaire

A total of 200 questionnaires were distributed to potential respondents. Of the completed questionnaires, 164 were eligible for analysis. The questionnaire was adequately administered to all relevant respondents from each stakeholder quota for all current and previous CASME projects. The instructions were explained verbally to all respondents. Respondents were made aware that they can freely ask questions of clarity should anything be unclear as they completed the questionnaire. They were also made aware that they could opt out of the process of completing the questionnaire at any time, should they wish to do so, without prejudice. Provision was also made to explain the questions in mother tongue to SGB members should they have a challenge understanding questions in English. Because of this anticipated reality, and as a

precautionary measure to reduce time, the number of questions for SGBs was reduced to five that covered each of the four research objectives and the main research question.

3.6 Analysis of the data

Data were analysed in Microsoft Office Excel in the main and summaries of scores were used to populate summary graphs in order to generalise easily on each question per stakeholder sector. There were few cases where context was the same and it was reasonable to group summary responses. Such graphs were populated and contained a collective view on a couple of questions with the same context.

A plan to use the GeoGebra software program was dropped because of its complexity and the nature of the data. The objective was to use summaries of entries from each question per stakeholder sector. GeoGebra would not give such views from summary numbers and required repeating the process already completed on Microsoft Office Excel. It is for that reason that the researcher resolved to drop its use; Microsoft Office Excel summaries sufficed.

The analysis remained valid and reliable, in that any Microsoft Office Excel user would generate the same graphs using the results of a similar tick-response questionnaire. The data were reliable as there were no issues like 'spoilt' questionnaires or invalid entries. The nature of the questionnaire eliminated all chances of respondents responding inappropriately or irrelevantly, since it was more of a Likert scale with 'yes' or 'no' responses.

3.7 Summary

In summary, a quantitative approach was best to use in the context of the research question and allowed a lot more time for analysis than a qualitative approach would have. Respondents were not overwhelmed by the questionnaires. Their anonymity was ensured as no space was provided for respondents to write their names. This made respondents feel absolutely protected from prejudice and they gave their honest opinions on the respective questionnaires.

It also helped to undertake pre-testing and validation, especially with the teachers of Ixopo High School in Sisonke District. This gave confidence to the researcher in terms of practicability of the research and the potential ambiguity of some of the questions

to be asked of stakeholders. The questions for teachers were cleared in this way, but not many of other respondent stakeholders could be reached in Sisonke District. However, a calculated decision was made in respect of SGBs, because of the need for interpretation and translation into Zulu, to reduce the number of questions to five.

CHAPTER 4: PRESENTATION OF RESULTS

4.1 Introduction

This chapter presents results that were found from the analysis of the questionnaire responses. The results are presented per stakeholder sector, as explained in Chapter 3 of the dissertation. Themes have been packaged from the similarities of context in the questionnaire, the results of which are presented per stakeholder sector. However, mathematics teachers' responses were apportioned greater weighting because of the importance of their input in relation to the impact of CASME in their lives. The chapter ends by summarily highlighting the significance of graphical representation of results, and introduces what is coming up in the next chapter, namely the discussion of the results.

4.2 Views of mathematics teachers on various aspects of CASME's impact in Umlazi District

4.2.1 Possession of necessary documents for effective teaching and learning

Figure 4.1 represents the analysis of mathematics teachers' responses to Questions 1 to 4 of the mathematics questionnaire. These were strategically sequenced as they revolved around the same theme: possession, by mathematics teachers of necessary documentation for effective teaching and learning. It makes sense to group the analysis to form a bigger picture view of how teachers feel about CASME's impact or influence on the aspects asked in the questionnaire on this theme.

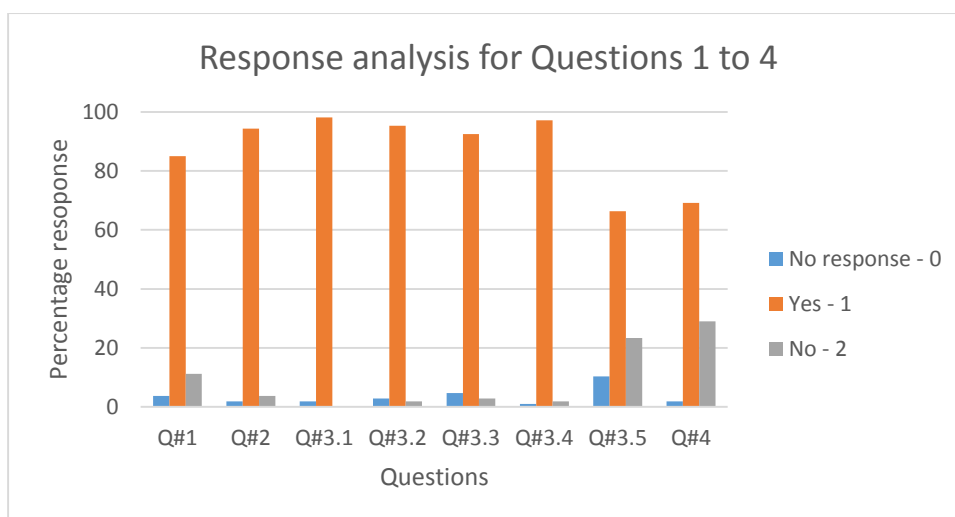


Figure 4.1. Possession of necessary documents for effective teaching.

Question 1 asked whether respondents had been previously or were currently involved in a CASME-implemented project. Out of 107 mathematics teachers, 91 (85%) teachers responded positively, 11% responded negatively and 4% did not respond completely to the question asked.

Question 2 asked if respondents were suitably qualified to teach mathematics at the phase they taught. Out of 107 mathematics teachers, 101 (94%), said that they were suitably qualified to teach mathematics at the phase they taught, while 4% said they were not qualified and 2% did not respond to the question.

Question 3, inclusive of all five sub-questions (3.1 to 3.5), asked if respondents had the necessary documents to teach mathematics effectively at the phases they taught. This question enumerated in the five sub-questions all the documents every mathematics teacher must have in order to teach and cover the curriculum in full. An average of 90% (96 out of 107 mathematics teachers) responded 'yes' to having all necessary documentation, while an average of 6% responded as not having all the necessary documentation. Notably, in Question 3.5 a high percentage of 23% of mathematics teachers responded as not having grade-specific mathematics pace-setters.

Question 4 asked mathematics teachers if they always covered the grade-specific mathematics curriculum in full. Out of 107 mathematics teachers, 69% (74 teachers) responded positively while 29% responded negatively and 2% did not respond to the question.

4.2.2 Planning, preparation, assessment and feedback

Figure 4.2 shows analysis of a collection of questions and sub-questions on the theme packaged as planning, preparation, assessment and feedback. The rating scale used in this graph ranged from 1 to 5, where 1 is very poor and 5 is excellent.

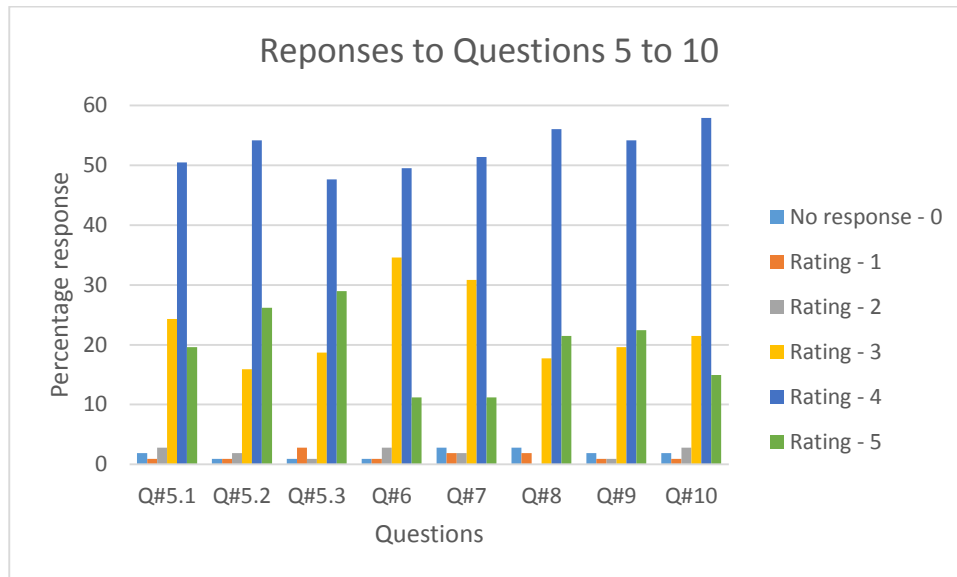


Figure 4.2. Planning, preparation, assessment and feedback.

Question 5.1 asked mathematics teachers to rate themselves on how well they planned for the term ahead. Of the 107 mathematics teachers, 20% rated themselves 5 in planning for the term ahead; 50% rated themselves 4, 24% rated themselves 3, while 3% of the respondents rated themselves 2 and 1% rated themselves 1. Of the 107 respondents 2% did not rate themselves on planning well for the term ahead.

Questions 5.2 through to 8 asked teachers to rate themselves on assessment and lessons delivery aspects. These are related and were analysed together. An average of 19.6% of 107 mathematics teachers rated themselves positively, at 5 on the rating scale. Slightly above half of 107 mathematics teachers (51.8%) rated themselves 4 (very good), 23.8% rated themselves 3, 1.6% rated themselves 2, while 1.8% rated themselves 1 and another 1.8% did not make a commitment on this cluster of related questions.

Questions 9 and 10 asked respondents about how well they gave and used feedback after marking pupils' work. An average of 18.5% of 107 respondents felt positive, rating 5, about how they give and use feedback after assessment activities. Of the 107 mathematics teachers 56% rated themselves at 4, their feedback being that methods are good. An average of 20.5% of respondents rated themselves at 3, which is a neutral stance in terms of how they give and use feedback after each and every assessment of the pupils. An average of 2% of the 107 mathematics teachers responded negatively, giving a rating of 2, while 1% responded very negatively, with a rating of 1 and 2% did not give a view on these questions.

4.2.3 Learning resources and methods

Figure 4.3 provides analysis of Question 11 with all its sub-questions (11.1 to 11.7). This question asked respondents to use a Likert scale from 'strongly disagree' to 'strongly agree' on two aspects, namely how their pupils learned and what resources they learned best from.

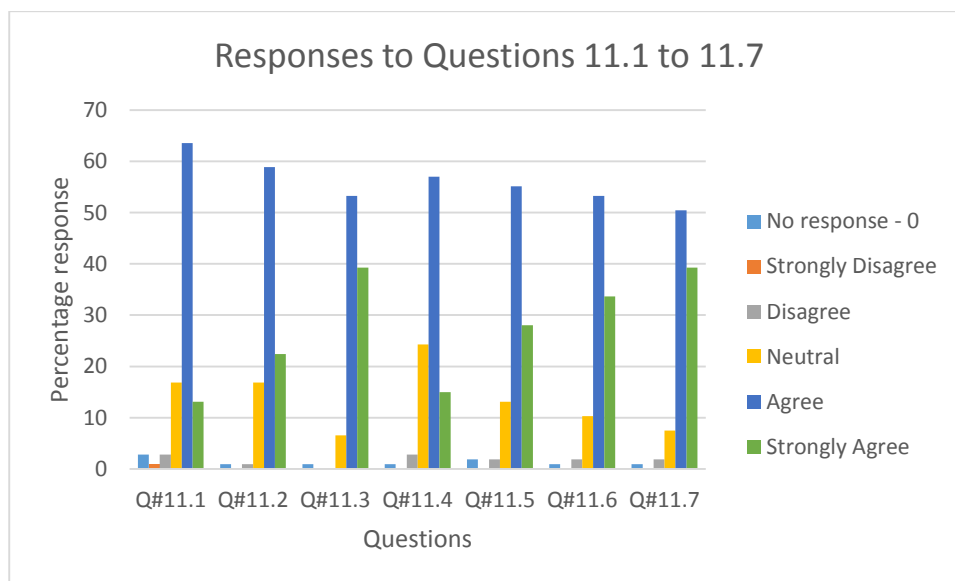


Figure 4.3: Learning resources and methods of learning.

Question 11.1 asked mathematics teachers whether their pupils learned mathematics from the textbooks or not. Of the 107 respondents, 13% strongly agreed while 1% of the 107 respondents strongly disagreed; 64% agreed while 3% disagreed; 16% had neutral opinions; and 3% did not give their opinion to this question.

Question 11.2 and 11.3 asked respondents if their pupils learned better if knowledge is displayed on charts and on the chalkboard. An average of 30.5% strongly agreed while none of the 107 mathematics teachers strongly disagreed. An average of 0.5% of the 107 mathematics teachers disagreed while 56% agreed. An average of 12% of the 107 mathematics teachers felt neutral and 1% did not respond.

Questions 11.4 through to 11.7 asked mathematics teachers if their pupils learned better as individuals, in pairs, in groups or as whole class. An average of 29% of the 107 respondents strongly agreed while none strongly disagreed. An average of 53.75% of the 107 respondents agreed while 2.25% disagreed. An average of 13.5% of the 107 respondents felt neutral about these questions while 2.5% did not want to give their opinion on these questions.

4.2.4 Frequency of written mathematics work in the classroom and outside the classroom

The questions 12.1 to 12.5 were into the same theme in terms of frequency of class work, homework and assignments (Figure 4.4).

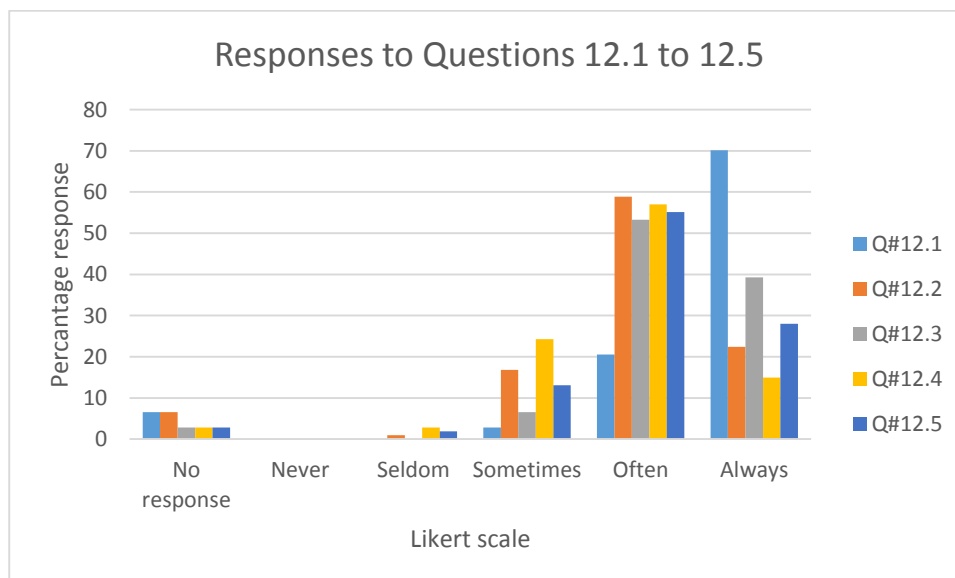


Figure 4.4: Frequency of written mathematics work.

Question 12.1 asked respondents how frequently they gave written mathematics class work to their pupils. Of the 107 respondents, 70% said they always give class work to their pupils and 20% often do so, while 3% give class work sometimes or occasionally; 7% of respondents did not give their opinion.

Question 12.2 asked respondents if they give pupils a chance to make journal entries after each mathematics lesson. Of the 107 respondents, 22% said they always give a chance to their pupils to make journal entries after each lesson; 58% indicated that they often did, while 16% indicated sometimes and 1% indicated seldom. Three per cent of the 107 respondents did not give their opinion.

Question 12.5 asked teachers how frequently they gave mathematics homework to their pupils. Of the 107 mathematics teachers, 28% responded positively as always giving homework and 2% responded negatively as seldom giving homework to their pupils; 54% of the 107 respondents said they often give homework while 12% said they sometimes do so. Two per cent of the 107 respondents seldom gave homework to their pupils, while another 2% did not give an opinion on this question.

4.2.5 Adequacy of books, quality of books and honouring of the teaching time-table

Questions 13–15 were grouped because of their relatedness (Figure 4.5).

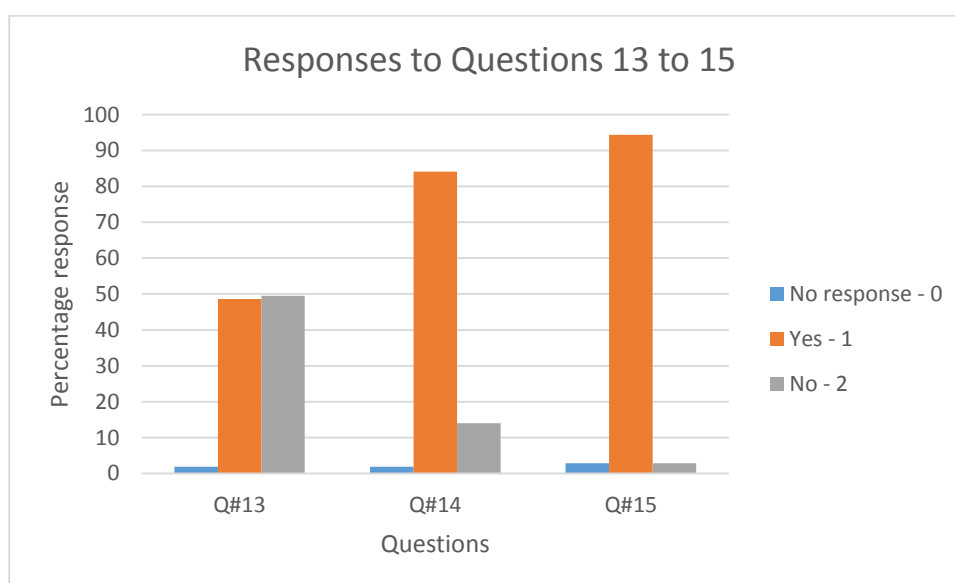


Figure 4.5: Adequacy and quality of books used.

Question 13 asked mathematics teachers whether their pupils each had a copy of the mathematics textbook or not. Of the 107 respondents, 48% agreed that their pupils each had a copy of mathematics textbook, while 50% said their pupils did not have mathematics textbooks and 2% did not give their opinion.

Question 14 asked respondents how satisfied they were with the quality of books they use in class with their pupils. Of the 107 mathematics teachers, 84% responded positively while 14% responded negatively; 2% of the 107 respondents did not give their views.

Question 15 asked if the respondents observed and honoured the teaching time-table as they should. Of the 107 mathematics teachers, 94% responded positively while 3% responded negatively and 3% did not give their opinion.

4.2.6 Views of Umlazi District mathematics teachers on CASME's workshops and classroom support visits

Figure 4.6 shows analysis of a cluster of direct questions to mathematics teachers about the impact of CASME in their lives and school at large.

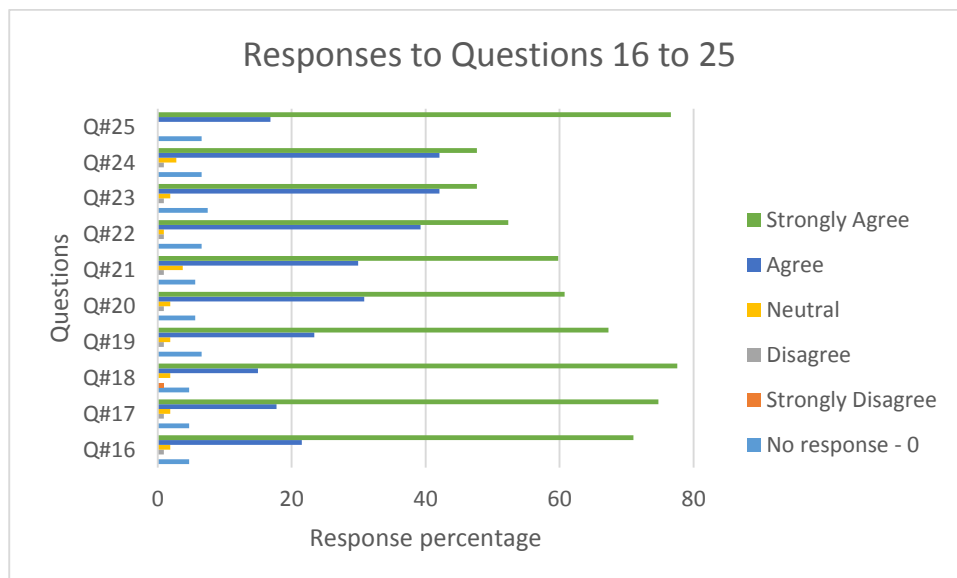


Figure 4.6: Impact of CASME as viewed by project mathematics teachers.

Question 16 asked mathematics teachers if they enjoyed CASME-facilitated workshops or not. Of the 107 respondents, 71% strongly agreed that they did enjoy them while none of the respondents strongly disagreed; 21% of the 107 respondents agreed while 1% disagreed and 2% were unsure and opted to be neutral. Meanwhile 5% opted not to give their opinion.

Question 17 asked mathematics teachers to rate the level at which they had benefitted from CASME workshops. Of the 107 respondents, 78% strongly agreed that they have always benefitted from attending CASME-facilitated workshops, while none of the teachers strongly disagreed, 3% of the 107 respondents had a neutral feeling about the benefit of attending CASME workshops, 18% agreed that they always benefitted from attending CASME facilitated workshops and 1% disagreed.

Question 18 asked mathematics teachers if they would recommend CASME workshops to fellow mathematics teachers that had never attended CASME workshops. Of the 107 respondents, 78% strongly agreed that they would recommend CASME workshops to other mathematics teachers, while 1% strongly disagreed; 14% of the 107 respondents agreed that they would recommend CASME workshops to other mathematics teachers, while none of the respondents disagreed; 2% of the 107 respondents had a neutral feeling in relation to this question, while 5% of the respondents did not want to commit their views.

Question 19 asked mathematics teachers if their practices had changed positively because of CASME support. Of the 107 mathematics teachers, 67% responded positively and no respondents strongly disagreed with the notion of this question; 23% of the 107 mathematics teachers agreed with the statement while 1% disagreed; 2% remained neutral while 7% opted not to respond.

Question 20 asked mathematics teachers if they felt more competent in their job because of attending CASME workshops. Of the 107 respondents, 61% strongly agreed with the statement and no teachers strongly disagreed; 30% of the 107 respondents agreed while 1% disagreed, 3% remained neutral and 5% did not commit their views.

Question 21 asked if the classroom practices of mathematics teachers had changed for the better because of CASME classroom support. Of the 107 mathematics teachers, 60% responded positively and no respondents strongly disagreed with the notion of this question; 30% of the 107 mathematics teachers agreed with the statement while 1% disagreed and 4% remained neutral. Meanwhile 5% of the 107 mathematics teachers opted not to respond to this question.

Question 22 asked mathematics teachers if CASME had influenced their behaviour through demonstration lessons. Of the 107 respondents, 52% strongly agreed with the statement and no teachers strongly disagreed; 39% of the 107 respondents agreed with the statement while 1% disagreed and 1% remained neutral. Of the 107 mathematics teachers 7% did not commit their views on this question.

Question 23 asked respondents to rate effectiveness of the coaching and mentoring role played by CASME in their lives as mathematics teachers when it comes to assessment of pupils. Of the 107 respondents, 48% strongly agreed that their assessment criteria and content have improved because of the coaching and mentoring by CASME and none of the respondents strongly disagreed; 42% of the 107 respondents agreed with the notion of the question while 1% disagreed and 2% remained neutral; 7% of the 107 respondents did not give their opinions on this question.

Question 24 asked respondents to rate themselves on how effective their feedback sessions had become after working closely with CASME in their projects. Of the 107 respondents, 45% strongly agreed that their feedback sessions have become more meaningful and informative after support from CASME while none strongly disagreed; 45% of the 107 respondents agreed with the notion of this question while 1% of the respondents disagreed; 3% of the 107 respondents had a neutral feeling while 6% did not want to commit their views.

Question 25 asked mathematics teachers whether or not they would welcome support from CASME in other projects in future. Of the 107 mathematics teachers, 77% strongly agreed that they would welcome CASME support in future while none strongly disagreed; 16% of the 107 mathematics teachers agreed while none disagreed, and 7% did not give their opinion on this question.

4.3 Views of School Principals and Deputy Principals on the effectiveness of CASME's programmes in their schools

Figure 4.7 shows analysis of school management opinions regarding the effectiveness of CASME's projects in their schools. All responses to questions were summarised in one graph because of the small number of questions. It therefore made sense to group all responses in one graph. All questions, except Question 6, wanted school managers to use a rating scale of 1 to 5, where 1 is very poor and 5 is excellent. To avoid

confusion a numerical scale was not used in this graph but rather words, as can be seen on the X-axis of the graph. Question 6, which was the final question, was a 'yes' or 'no' question, analysis of which is included in this same graph.

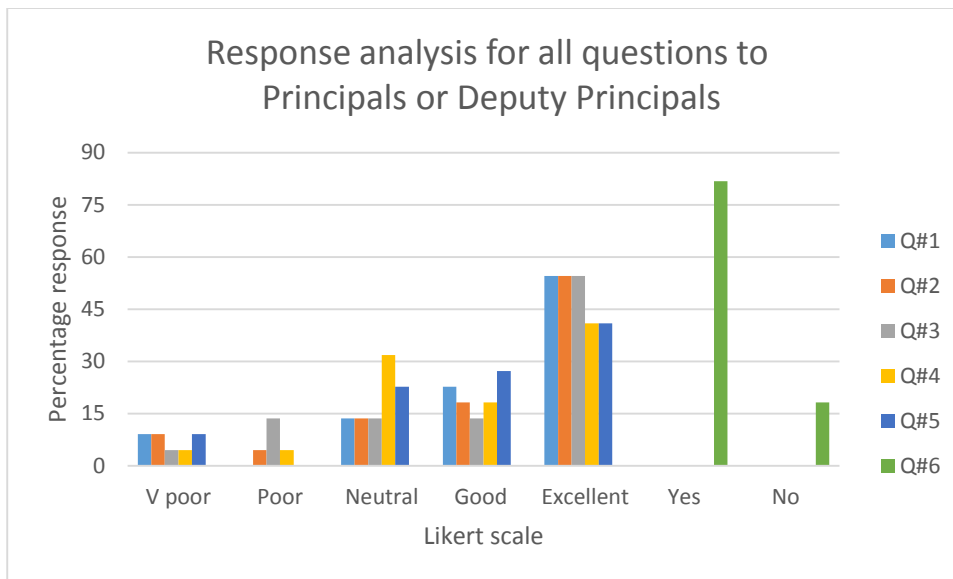


Figure 4.7: School Management Teams' (SMTs') views on CASME's impact.

Question 1 asked school managers how well they understood the objectives of CASME-implemented projects in their school. Of the 22 school managers, 55% understood the CASME-implemented project objectives excellently while 8% very poorly understood the project objectives; 23% of the 22 school managers had a good understanding of the project objectives while none of the school managers had poor understanding and 14% had a neutral opinion.

Question 2 asked school managers how well they knew their specific role in the CASME-implemented projects in their schools. Of the 22 respondents, 55% said they knew their role excellently and 8% very poorly knew their role in terms of this question; 18% of the 22 respondents said their knowledge of their role was good while 5% poorly knew their role and 14% gave a neutral response.

Question 3 asked school managers how well they monitored teachers' work in respect of CASME-implemented projects in their schools. Of the 22 respondents, 55% said they monitored teachers' work excellently and 5% answered very poorly in terms of this question; 14% of the 22 respondents said their monitoring of teacher work was good while 14% poorly monitored in respect of this question and 12% gave a neutral response.

In Question 4, school managers were asked to rate the frequency of feedback they received from school Heads of Departments (HODs) in relation to CASME-implemented projects. Of the 22 respondents, 41% said the frequency of feedback was excellent and 5% that it was very poor; 18% of the 21 respondents said the frequency of feedback was good while 5% indicated poor frequency of feedback from the HODs; 31% of the 22 school managers gave a neutral response.

In Question 5, school managers were asked to rate their frequency of reading and reflecting on CASME progress reports submitted to all stakeholders. Of the 22 respondents, 41% said their frequency of reading and reflecting on CASME reports was excellent and 9% said their frequency was very poor; 27% of the 22 respondents said their frequency in relation to the question was good while none of the respondents indicated poor frequency, and 23% responded as neutral on this question.

Question 6 asked school managers to indicate whether they were confident that CASME-implemented projects would improve mathematics achievements in their schools or not. This was a 'yes' or 'no' question, to which 82% of the 22 school managers responded positively and 18% responded negatively.

4.4 Role of SGBs in CASME-implemented projects in Umlazi District

Figure 4.8 represents analysis of SGB members' responses to questionnaire questions. A total of 25 SGB members responded to the questionnaire.

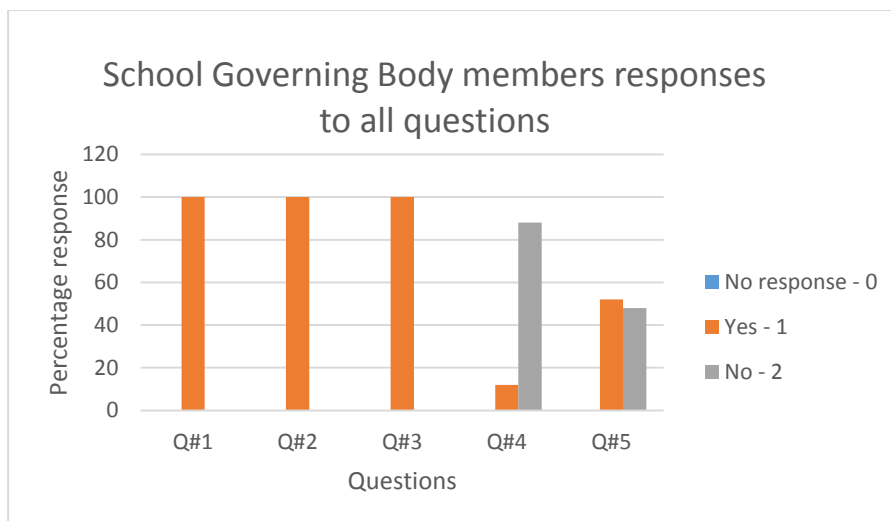


Figure 4.8: SGB members' views on CASME's impact.

In question 1, SGB members were asked whether they were aware of the CASME-implemented project to improve mathematics achievements in their school or not. To this question, 100% of the 25 SGB members responded positively and none responded negatively.

Question 2 asked SGB members whether they thought there was a need for such an intervention to improve mathematics achievements in their schools or not. To this question, 100% of the 25 SGB members responded positively and none responded negatively.

In Question 3, respondents were asked whether they had confidence in such initiatives improving mathematics achievements in their schools or not. To this question, 100% of the 25 SGB members responded positively and none responded negatively.

Question 4 asked respondents if they received and read CASME project progress reports or not. To this question, 12% of the 25 SGB members responded positively and 88% responded negatively.

In Question 5, SGB members were asked whether or not they thought their school benefitted from CASME through the implemented project. To this question, 52% of the 25 SGB members responded positively and 48% responded negatively.

4.5 View of Umlazi District Officials on the effectiveness of CASME's intervention in mathematics challenges of Umlazi District

Figure 4.9 represents a summary analysis of the District Officials' responses to the questionnaire. Most of the respondents were Subject Advisers with a few Circuit Managers and district office-based officials. All questions asked to District Officials were on a Likert scale using 'strongly agree' through to 'strongly disagree'.

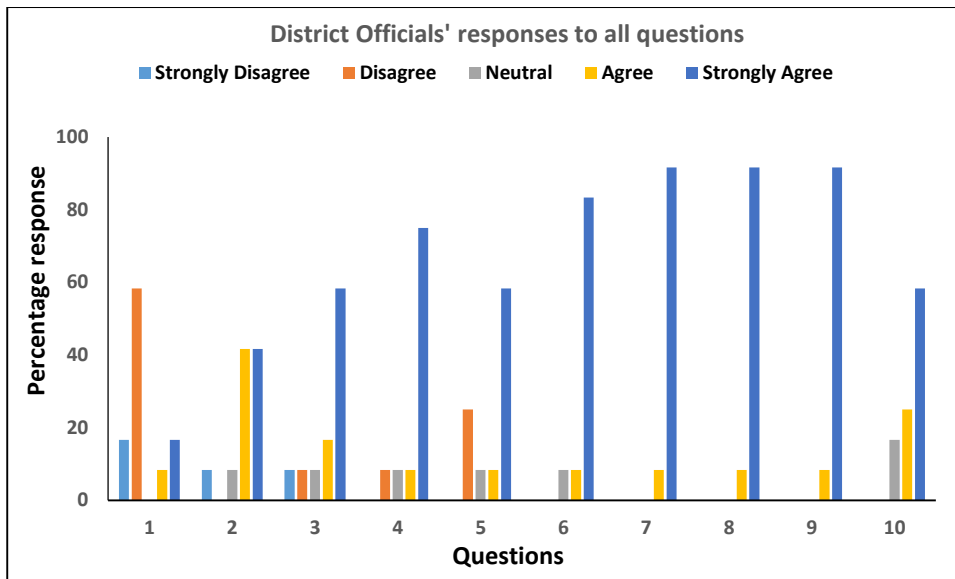


Figure 4.9: District Officials' views on CASME's impact.

Question 1 asked District Officials to rate whether or not Umlazi District had enough qualified mathematics teachers to teach mathematics in the district schools. Of the 12 respondents, 17% strongly agreed that there were enough qualified mathematics teachers in Umlazi District and 8% just agreed; 17% of the 12 strongly disagreed and 58% disagreed in relation to the question. There were no neutral responses.

In Question 2, respondents were asked if they thought Umlazi District had a crisis or challenges when it came to the teaching and learning of mathematics. Of the 12 respondents, 42% strongly agreed that there were crises or challenges in Umlazi District and 42% agreed; 8% of the 12 respondents strongly disagreed and 8% disagreed in relation to the question. There were no neutral responses.

Question 3 asked District Officials whether they provided enough support to CASME to implement the projects or not. Of the 12 respondents, 58% strongly agreed with the notion of the question and 18% agreed. This means 76% said yes. 8% of the 12 respondents strongly disagreed and 8% disagreed, while another 8% were neutral. This means 24% of the respondents said no.

In Question 4, District Officials were asked whether or not they had knowledge of all the schools in the Umlazi District which had CASME-implemented projects. Of the 12 respondents, 76% strongly agreed that they had knowledge of all CASME project schools in Umlazi District and 8% agreed; 8% of the 12 respondents disagreed and 8% were neutral. This means 84% said yes and 16% said no in this question.

In Question 5, respondents were asked if they regularly received and read CASME project progress reports or not. Of the 12 respondents, 58% strongly agreed that they received and read the progress reports, while 8% agreed. None of the 12 respondents strongly disagreed, while 26% disagreed and 8% gave a neutral response. This means 64% said yes and 36% said no in this question.

Question 6 asked respondents to rate their confidence in CASME as a service provider in the projects to improve mathematics achievements in selected Umlazi District schools. Of the 12 respondents, 84% strongly agreed that they had confidence in CASME projects to improve mathematics achievements in Umlazi District and 8% agreed; 8% of the respondents were neutral in relation to the question. This means 92% said yes and 8% said no in this question.

Question 7 asked District Officials if they had confidence in the knowledge that CASME shared with the mathematics teachers of Umlazi District. All 12 District Officials responded positively, with 92% strongly agreeing and 8% agreeing. This means 100% said yes in this question.

In Question 8, District Officials were asked if they would always prefer CASME to implement such projects in their district. All 12 District Officials again responded positively to this question, with 92% strongly agreeing and 8% agreeing. This means 100% said yes in this question.

In Question 9, respondents were asked if they would recommend CASME to other districts or not. All 12 District Officials responded positively, with 92% strongly agreeing that they would recommend CASME to other districts of education and 8% agreeing. This means 100% said yes in this question.

Question 10 asked District Officials how confident they were that mathematics results would improve in the project schools because of support from CASME. Not all 12 District Officials responded positively this time, with 58% strongly agreeing with the notion of the question and 25% agreeing; 8% of the 12 District Officials had a neutral opinion in respect of this question. This means 83% said yes and 17% said no in this question.

4.6 Perspective of CASME on its projects rolled out in Umlazi District

Figure 4.10 shows analysis of CASME staff responses to questionnaire questions. A total of 18 CASME staff members responded to the questionnaire, which constitutes 100% of the CASME payroll, including management and the directorate.

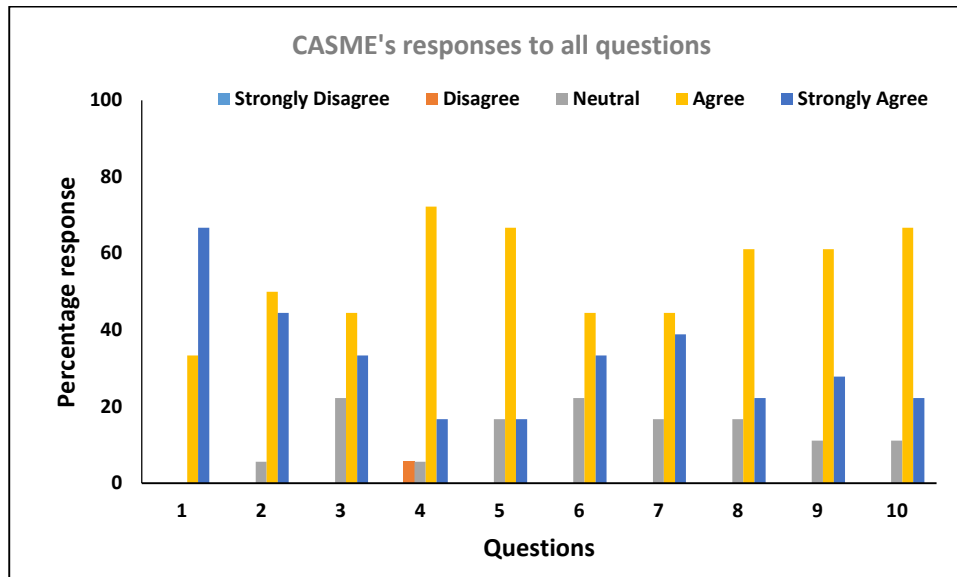


Figure 4.10: CASME's views on its delivery of projects in Umlazi District.

Question 1 asked CASME staff if they thought there was a need to intervene in Umlazi District schools to improve achievements in mathematics across all phases. Of the 18 respondents, 12 strongly agreed with the notion of this question and 6 agreed. None of the 18 respondents disagreed or reserved comment by being neutral.

In Question 2, CASME staff members were asked if they targeted Umlazi District teachers of mathematics because of the rural nature of the district or not. Of the 18 respondents, 8 strongly agreed that this district was targeted because of its rural nature, while 9 agreed and 1 was neutral on the question.

Question 3 asked CASME staff if the organisation had a tried-and-tested turnaround strategy to improve mathematics results in Umlazi District or not. Of the 18 respondents, 6 strongly agreed with the notion of this question and 8 agreed; 4 of the 18 respondents reserved their comments by being neutral.

In Question 4, CASME staff were asked to rate their view that they had solutions to South African mathematics achievement crises or challenges. Of the 18 respondents, 3 strongly agreed that CASME had solutions to South African mathematics achievement crises or challenges and 13 agreed; 1 of the 18 respondents disagreed while 1 remained neutral on the question.

Question 5 of the questionnaire was about facilitation by CASME. The question asked CASME staff to rate their feeling about facilitators' competence and knowledge. Of the 18 respondents, 3 felt strongly that CASME had world-class facilitators in terms of content knowledge and facilitation skills, while 12 agreed; 3 of the 18 respondents did not want to give their opinions in relation to this question.

In Question 6, CASME staff were asked to rate the material that they used for workshops with mathematics teachers. Of the 18 respondents, 6 felt strongly that CASME produced world-class workshop material that teachers could readily use with their pupils in class, while 8 agreed; 4 of the 18 respondents did not want to give their opinions in relation to this question.

Question 7 asked CASME staff to rate their classroom support effectiveness to mathematics teachers of Umlazi District project schools. Of the 18 respondents, 7 strongly agreed with the notion of this question and 8 agreed; 3 of the 18 respondents reserved their comments by being neutral.

In Question 8, respondents were asked to rate CASME's pupil tuition programme where this aspect was built into projects under teacher development. Of the 18 respondents, 4 strongly agreed with the notion of this question and 11 agreed; 3 of the 18 respondents did not comment by remaining neutral.

Question 9 asked CASME staff to rate the effectiveness of their training and the in-service development programme they provided to mathematics project teachers of Umlazi District. Of the 18 respondents, 5 strongly agreed that the training and in-service development was effective and 11 agreed; 2 of the 18 respondents reserved their comments by being neutral on the question.

In the final question, respondents were asked to rate how CASME mathematics development programmes affected teachers' behaviour and performance in Umlazi District. Of the 18 respondents, 4 strongly agreed that CASME mathematics development programmes positively affected teachers' behaviour and performance in Umlazi District and 12 agreed; 2 of the 18 respondents did not want to comment and remained neutral.

4.7 Summary

This chapter presented the results as they emerged from the survey. Results were shared per stakeholder sector as defined in Chapter 1. The results shared in this chapter showed a number of trends; these are discussed in detail in the next chapter. It was also discerned in this chapter that various stakeholder sectors have different opinions on the role of CASME in Umlazi District of the KZN DBE in terms of improving mathematics achievements in the project schools.

Results presented in the chapter reflect the genuine feelings of respondents in relation to the impact of CASME in project schools of Umlazi District. All graphical analysis showed positive results in relation to questions per stakeholder sector. Although many of these questions were grouped as per the theme they represented, many of them – especially on critical stakeholders like mathematics teachers and CASME – were individualised to get a clearer picture of their opinions in relation to the research question.

The next chapter presents all the findings and discusses the impact of CASME on Umlazi District mathematics teachers of project schools across all phases of formal schooling.

CHAPTER 5: DISCUSSION

5.1 Introduction

This chapter discusses the results that were presented in Chapter 4. This chapter constitutes the interpretation stage of the raw results, with a view to arriving at conclusions relating to the main research question. It must be recalled that Chapter 2 highlighted Kirkpatrick's model of evaluating the effectiveness of training programmes. Chapter 4 presented the results for the survey conducted through the quantitative method. In this chapter, these results are interpreted to give a view in relation to the main research question, being the impact of CASME support to schools to improve results in mathematics in Umlazi District. This chapter again provides the four objectives of the study and the subsequent research questions, which will help to connect the conclusive and summary statements made in the discussion below to relevant objectives. Ultimately it makes a resounding statement as to whether or not CASME impacts positively on projects mathematics teachers in Umlazi District.

5.2 Mathematics project teachers' views on the impact of CASME in Umlazi District

It is important to explain that due to many questions asked in the questionnaire for teachers of mathematics in the project schools, some which had the same theme were fused together to facilitate analysis. The discussion starts with the teachers' component, because this formed the largest part of the basis of the four objectives of this dissertation. Most of the answers to the investigation questions were drawn from mathematics teachers' opinions as direct beneficiaries of CASME-implemented projects.

The first set of results pulls together a group of four main questions with Question 3 having five sub-questions, all requiring a 'yes' or 'no' answer from the project mathematics teachers. In all these questions 'yes' responses ranged from a high rate of 97% and a low rate of 66% of total valid responses to the questionnaire. Project mathematics teachers overwhelmingly agreed that they were suitably qualified to teach mathematics at the phase and grades they were teaching. They felt very strongly that they understood the National Curriculum and Assessment Policy Statements

(CAPS) requirements, and had all relevant policy documents and guides for the relevant grades at the phase at which they were teaching mathematics. It is, however, puzzling that 23% of the 107 mathematics teachers did not have grade-specific pace-setters. The pace-setter is the tool put in place to ensure sequential and timeous curriculum coverage. It is drawn from the CAPS prescripts and ensures that the full curriculum for that particular grade is covered in a given curricular year.

Undoubtedly, however, some answers to the second objective of this research were solicited in this response. It can be discerned from the project mathematics teachers that CASME has influenced the good practice of having and using consistently departmental policy documents, CAPS, various forms of effective plans and work schedules, including grade-specific pace-setters. CASME works with the project mathematics teachers on all of these over and above content and assessment issues. There is a strong positive correlation between effective use of these documents together with good plans and the pupil results. Where these documents and plans are in place and effectively used by the mathematics teachers, pupil results showed some improvements. However, the point solicited from these responses is that it is good practice to plan and use departmental policies correctly. This renders mathematics teachers effective and productive in their work in the classroom.

In part, the third objective of this research, being to assess the effectiveness of CASME's model of intervention at Umlazi District project schools, was partly answered in these four main questions. The fact that CASME diversified its offering of services and tapped into non-content and assessment issues speaks to how watertight CASME's model of intervention is. It does seem that CASME's model of intervention embraced clear instructional and collective leadership with project mathematics teachers, followed by engaging and productive problem-solving discourse. These added up to an effective intervention model that CASME used to develop and grow project mathematics teachers in various schools in Umlazi District.

The set of Questions 5 to 10 of the mathematics teachers' questionnaire each used a rating scale of 1 to 5, where 1 is very poor and 5 is excellent. Project mathematics teachers gave their rating on how their planning, preparation, assessment and feedback skills were impacted on by CASME through the projects. Mathematics teachers predominantly (between 50% and 58% of 107 respondents) rated CASME's

impact at 4, while between 11% and 29% rated CASME at 5 in terms of impact on the said attributes of project mathematics teachers. This is an expression of highest satisfaction level by mathematics teachers that CASME does benefit them and that there is value in becoming a CASME project school. This addressed the first of the four research objectives, being to assess the level of impact of CASME in improving mathematics achievements at Umlazi District of the DBE. However, it cannot be generalised with a confidence level of 95% at 0.05α that all mathematics teachers of Umlazi District would feel the same as the 63 (58% of 107 respondents) project mathematics teachers that so felt in response to these questions of the questionnaire.

Unless teachers are aware of the learning styles for their pupils, their teaching will forever be misguided. It is important for teachers to plan for teaching and assessing in accordance with how their pupils learn mathematics in class. To test this statement further, a pack of questions whose theme related to how project mathematics teachers' pupils learned mathematics in their classroom was asked. There was agreement amongst respondents that their pupils learnt mathematics better from books, on charts and on the chalk board, compared to as individuals and in pairs. There was quite strong disagreement from 39% of the 107 respondents that their pupils learnt mathematics better as a whole class. This revelation therefore suggests that one of the limiting factors to adequate mathematics achievements could be whole-class teaching, which speaks to the fourth objective of the research.

Projects mathematics teachers embraced CASME's model of intervention fairly well, in that a large percentage of respondents always gave written class work and allowed time for pupils to complete learning journals, tests, assignments and homework. These are key components to constructive feedback and reflection by both teachers and pupils. Learning journals are instrumental in creating what Hobden and Hobden (2013) refer to as a self-regulated pupil. In their teacher development manual for a differentiated teaching approach created for the Zenex-Inkanyezi pilot project in Pinetown District schools, Hobden and Hobden explained how learning journals can be used as a reflective exercise for self-regulated pupils, and how that had a propensity to enhance conceptual understanding with an ultimate goal of improving pupil attainment. This study found that CASME project teachers of mathematics used those methods to some degree, with exercises from textbooks being the most used method of writing mathematics.

The *South African Journal of the Institute of Mathematics Education* highlighted that provisioning of resources in SA to drive excellence in pupil attainments is still a challenge (Kriek & Grayson, 2009). In a question put to project mathematics teachers in their questionnaire, 48% of the 107 respondents said they had enough books for their pupils and 50% said they did not have enough books for their pupils, while 2% did not comment on this question. This is a limiting factor that was clearly beyond CASME's mandate in their projects that they rolled out. It remains the responsibility of the DBE to provide enough books for pupils in schools. CASME, however, does provide workshop manuals that are readily usable with pupils in the classroom, and does not reserve the right to make copies only for pupils.

However, it raises hope that project mathematics teachers overwhelmingly expressed satisfaction about the quality of books they used with pupils in their classrooms. Of the 107 respondents, 84% agreed that the books they used are of quality; 14% disagreed while 2% refrained from making comment. This suggests that underperformance in Umlazi District is not linked or related to poor quality of books that project mathematics teachers use.

Of the 107 respondents, 94% attested to the fact that they observed the teaching timetable and honoured all their teaching periods. This strong view also ruled out bunking of classes by project mathematics teachers as a factor for underperformance in Umlazi District. This suggests that if teachers are supported well on content knowledge and teaching methodologies, they will have confidence in going to class to teach pupils. Project mathematics teachers of Umlazi District are supported by CASME and consequently did not bunk classes and honoured their prescribed teaching periods. Literature confirms that the quality of resources used affects student achievements in the South African system of education (Greenward et al., 2005).

Of the 107 respondents, 71% strongly agreed and 21% agreed that they enjoyed attending CASME-facilitated workshops. This refers to the effectiveness of CASME's model of intervention in the form of clear instructional leadership followed by robust problem-solving. Continued attendance of any workshop depends on the personal value derived from attending those workshops. It is therefore informed thinking to attribute the expression of continued attendance at CASME-facilitated workshops to good quality of material provided and the skilful nature of CASME facilitators. Such a

high percentage of agreement cannot be coincidental. This continued attendance was backed up further by strong agreement and agreement, at 75% and 18% respectively, of the 107 respondents who said they had always benefitted from attending CASME-facilitated workshops.

The strong agreement of 78% and 15% agreement by project mathematics teachers that they would recommend CASME workshops to fellow colleagues who had never attended CASME-facilitated workshops augurs well for the impact of CASME support in Umlazi District project schools. The project mathematics teachers expressed a view that can be translated into a positive impact that CASME is making on the lives of project mathematics teachers. Again this expression of confidence by respondents to the work of CASME can be linked to sharing of best practices that yield results, effectiveness of CASME's model of intervention and overall impact level of CASME in improving mathematics achievements in Umlazi District.

Of the 107 respondents, 67% strongly agreed and 23% agreed that their practices as mathematics teachers had changed positively because of CASME workshops. This undoubtedly augurs well for CASME in terms of positively influencing teacher behaviour through workshops. Common sense again indicates that if teachers are in so much agreement on this point, then CASME's model of intervention so far works. Furthermore, of the 107 respondents 61% strongly agreed and 31% agreed that their competence in their job had improved because of attending CASME workshops as project mathematics teachers. Not only has project mathematics teachers' competence and behaviour changed, but also classroom practices are viewed in a positive light and teachers attribute this to CASME's classroom support mix. This assertion was confirmed with 60% of 107 respondents strongly agreeing and 30% agreeing with the stated fact.

Project mathematics teachers also felt very strongly that their delivery of lessons had become more effective and reflective because of CASME's demonstration lessons. This is another item on the menu of services of CASME that adds value to project teachers' lives. A strong view is again held by project mathematics teachers that CASME's coaching and mentoring, which form part of CASME's intervention model, had improved their assessment criteria and content knowledge. Furthermore, project mathematics teachers felt that their feedback sessions after each assessment of their

pupils had become effective and meaningful because of CASME's coaching and support in this aspect. Results of Questions 22, 23 and 24 bear testimony to this assertion. Finally, 77% of project mathematics teachers strongly agreed and 23% agreed that they would always welcome support that comes from CASME.

At this stage the Kirkpatrick model of evaluating effectiveness of training is revisited. In terms of the four stages, it can be discerned from the analysis of project mathematics teachers' responses that CASME does well in terms of Reaction, Learning and Transfer, the first three levels.

The continued attendance of CASME workshops is an indication of how project mathematics teachers reacted to the first CASME workshop or at least a couple of workshops at the beginning of these projects. It proves beyond reasonable doubt that CASME presented material that was relevant to mathematics teachers' needs and made their work easier. Undoubtedly, CASME's programme can be evaluated as successful against this first level as defined by Kirkpatrick, because of positive sentiments echoed by project mathematics teachers to many of the questions in the questionnaire.

Although CASME in its own right and the partnership agreement signed with the KZN DBE does give a pre-test and post-test to its project mathematics teachers in every workshop, learning (as the second level of evaluating effectiveness of training programmes as per the four stages of Kirkpatrick's model) is clearly seen to have taken place in CASME project mathematics teachers. This is supported by their confidence in honouring their teaching time-table, assessing and feedback sessions for their pupils, as noted in the results analysis. It proves that CASME does evaluate its programmes against this level and also adds the mathematics teachers' scores in pre- and post-tests. The mammoth challenge now is whether this translates into improved pupil attainment or not.

A number of respondents echoed the same sentiments, that CASME had influenced their classroom practices a great deal. Examples of how mathematics teachers had improved in their competence and assessment skills were cited and strongly supported by valid arguments. The third level of Kirkpatrick's model suggests that Transfer of what has been learnt into observable better behavioural practices is critical for any training programme. This research has enumerated a number of aspects

relating to positive behavioural change by most of the project mathematics teachers. Planning was one of the critical highlights of this effect, and it is a known fact that a failure to plan is a plan for failure. Project mathematics teachers unequivocally credited CASME for behavioural change that has seen them become more effective in their classrooms.

Kirkpatrick used a business setting scenario to explain Level 4 of his training programme evaluation model. In the context of CASME, pupil results become the best success indicator of CASME's training programmes with project mathematics teachers. CASME engaged project mathematics teachers in numerous ways, and activities included mentoring and coaching of individual teachers. The result (as indicated in Level 4 of Kirkpatrick's model) is that as teachers become competent and acquire various other important skills through CASME programmes, pupil mathematics results should improve in the Umlazi District. However, this study did not intend to source data such as pupil results, and therefore cannot clearly establish how CASME performed on Kirkpatrick's Level 4.

5.3 Principals' and/or Deputy Principals' views on the impact of CASME in Umlazi District

Principals or/and Deputy Principals of all schools are expected to manage the school, including all support programmes that come to assist the school in whatever regard. Likewise, CASME-implemented projects are not immune from being subjected to the management of SMTs, as they are referred to by the South African Schools Act. It is therefore reasonable to expect that SMTs would have a good opinion of the impact of CASME on their school's mathematics teachers as a consequence of learning from their management of such assistance or support programmes. It is against this background that the researcher saw it as critical to elicit SMT views in relation to the main research topic, which formed an integral part of the overall summary and conclusion as to whether CASME impacts positively or not on its projects in Umlazi District.

A question was put to SMTs to assess their awareness of the objectives of the CASME-implemented projects in their schools. The response of 8% of SMTs as having poor understanding and 14% choosing to be neutral is alarming. One would expect all Principals of CASME project schools to be clear on the project's objectives so that

they can play a meaningful role in support of pursuit of those objectives. It is understood, however, that the main aim was to target CASME programmes, which seek answers from mathematics teacher development programmes and not the management of schools. However, with that in mind, it does impact on the credibility of their opinions as SMTs if such a fundamental aspect as understanding and embracing project objectives are not within their grasp. On the other hand, it is pleasing to note more than half (55%) of the valid respondents expressed solid awareness and understanding of the CASME-implemented projects' objectives.

On the question of the role of SMTs in CASME-implemented projects in Umlazi District, the research found that SMTs did play their part in managing the logistics of the projects within schools, but lacked tools to assess progress and impact on both teachers and pupil attainment. Although Principals reminded mathematics teachers to attend workshops on scheduled dates, follow-ups on the gains from the workshops were not strategically and consistently made. This reflects on the impact of CASME, as some of the sharing during workshops, classroom support visits, demonstration lessons and such require the SMT to monitor and support mathematics teachers as they implement approaches, tactics or techniques in their classrooms with pupils. To some degree CASME lacks an element to compel Principals into their role in the delivery of the project's objectives.

SMTs were asked how well they monitored teachers' work in respect of CASME-implemented projects in their schools. Again the research revealed some neglect of responsibility by SMTs in that only 55% of the valid respondents confidently confirmed that they do their part to the expected level and therefore see some behavioural changes in the teachers. Although Principals play a supervisory role in this aspect, consistent feedback from HODs in their schools is vital so that they can provide resources where needed and any form of support that might be required from them as heads of schools. This most certainly does not augur well with CASME, as it can be a limiting factor to the accomplishment of project objectives and hence limit the impact levels of CASME on the project mathematics teachers.

The above neglect of responsibility is further supported by lack of consistent feedback from HODs, as only 41% of valid SMT respondents confirmed that they received regular feedback from HODs on the progress made in the CASME- implemented projects for mathematics teachers. Coupled with this finding is another low rate of 41% of valid respondents who read and reflected on CASME progress reports that are submitted to all stakeholders as per project Service Level Agreement (SLA) prescriptions. Hanushek (2009) in his journal article entitled 'Throwing money at schools' argues that donor funding given to schools and not properly managed is a waste of financial resources. The same sentiment is shared by Jansen (2013), Vice-Chancellor at the University of Free State. It is clear therefore that SMTs that do not read and reflect on CASME reports will forever misplace their support in relation to CASME-implemented projects for mathematics teachers. It is in these reports that SMTs can pick up areas where support and monitoring is strongly needed. Again, such lack of management may cause CASME not to impact positively on project mathematics teachers of schools.

It reflects well on CASME in view of the main research question that 82% of SMT members that responded to the SMT questionnaire unequivocally agreed that they had confidence that CASME-implemented projects for developing mathematics teachers in Umlazi District would improve mathematics achievements in their schools. Besides all shortcomings that the research identified on the side of SMTs, CASME's impact on project mathematics teachers of Umlazi District remains positive. It can therefore be inferred, given the comments of the SMTs, that CASME truly impacted positively on the project mathematics teachers of Umlazi District. It is resolved that project mathematics teachers are no longer the same after CASME's intervention and that pupil attainment must start showing an upwards trajectory of incremental improvements.

5.4 SGBs' perceptions of the impact of CASME in Umlazi District

SGBs form an important component of decision-making in a school. This right is bestowed on the parents elected to assist and support the SMT in endorsing important decisions the SMT wants to make. These include, inter alia, financing, employment and buying decisions. Taking into account the fact that governing body members do not work within the schools but are only called on by the SMT as and when necessary, the researcher sought to limit the number of questions to the SGBs to only five. This was to ensure that the questionnaire was respondent-friendly and time-effective. Interpretation support was also anticipated as most SGB members are not fluent in the English language.

It was interesting to note the highest percentage awareness of CASME-implemented projects in Umlazi District among what one would categorise as laypersons, referred to as SGBs in most schools in SA. This expression of awareness suggests that CASME's visibility in project schools is apparent. It further suggests that stakeholder engagement in CASME-implemented projects is healthy, as the parent component is often neglected by NGOs in such roll-out of projects in schools. If SGBs are this aware of challenges that face mathematics teachers and are adversely affecting mathematics achievement, government would find it easy to put in resources where SGBs are fully behind supporting mathematics teachers with the best human, infrastructural and financial resources.

Of valid SGB respondents of Umlazi District in this study, 100% unanimously said there was a need for interventions to improve mathematics achievements in their schools. This agreement highlights the awareness of the plight among the parent component and further justifies the existence of CASME in Umlazi District. There is not much, however, to draw from this awareness in relation to the impact of CASME in improving mathematics achievements in Umlazi District project schools as the main question or focus in this dissertation. It only indicates how deep the mathematics underperformance challenge is, not only in Umlazi District but in the country as a whole.

SGB respondents unanimously agreed that they invest confidence in such initiatives to improve mathematics achievements in schools in Umlazi District. CASME is undoubtedly viewed as having solutions to all mathematics challenges in this district, and SGBs place confidence in CASME's support and hope that pupil attainments in mathematics will improve. As was expected, the parent component does not receive and read CASME projects' progress reports. A handful of SGB members claimed to have received and read CASME projects' progress reports. This does not augur well for CASME in terms of collaboration and support from all important stakeholders.

It was found that SGB members had mixed feelings about whether CASME benefitted their schools or not. This could be linked to the fact that SGB members generally did not read CASME reports where they possibly could have obtained insight into what support their school mathematics teachers have received from CASME. The almost 50/50 split of the respondents in terms of 'yes' or 'no' to the last question of the questionnaire, as to whether they had confidence that their schools were benefiting from participating in the CASME implemented project or not is indicative of these mixed feelings. It is also clear that SGB members generally do not have skills to analyse impacts such as that of CASME, and cannot read reports with the same insight as other stakeholders.

5.5 District Officials' views on the impact of CASME in Umlazi District

It was discerned from the District Officials that Umlazi District did not have enough qualified mathematics teachers. This clearly supports the need for the existence of CASME through donor-funded initiatives to support unqualified, under-qualified and non-professional teachers who only hold an academic qualification that is not a teaching profession qualification. Teachers who are not professionally qualified need a lot of support to learn how to teach in the classroom (Goldhaber & Brewer, 2009). Furthermore, teachers who do not hold formal certificates to teach are generally less confident and never engage their class interactively (Goldhaber & Brewer, 2009). It is therefore clear that this district needs the services of CASME if its own District Officials attest to the shortage of qualified mathematics teachers.

Umlazi District Officials also unanimously agreed that there are crises in the teaching and learning of mathematics in the schools of this district. Only a handful of officials did not agree that there is a crisis. There could be many factors causing this crisis, but a shortage of textbooks and lack of qualified mathematics teachers can be mentioned, amongst others, as lead factors. This finding further confirms that the presence of CASME in the Umlazi District is of the utmost importance. It further supports the notion of trying to gauge the impact of CASME in project schools in Umlazi District, with a view to widening the scope of support to possibly all Umlazi District schools, should good Samaritans come through with funding, and to other districts where CASME has never had mathematics teacher development projects.

District Officials also thought that they were giving CASME all the necessary support in order to implement projects successfully. If the District Officials were giving all the support to CASME-implemented projects, it meant that there was no sound reason for CASME not to maximise impact with the project mathematics teachers. It further suggests that CASME has extra hands in the form of DBE District Officials that it can use and exploit to advantage. The reason for such staunch expression of support by DBE officials could be linked to the value they derive from CASME's work with the project mathematics teachers. It could also be the benefits they indirectly receive, especially Subject Advisers, from CASME facilitators through workshops, classroom support activities and assessment issues. This, all summed up, speaks to the impact of CASME in Umlazi District.

The research found extreme levels of awareness of CASME-implemented projects among District Officials. This augurs well for CASME, as it implies that the impact is felt not only by project schools but also by District Officials of Umlazi District of the KZN DBE. It also found that quite a good percentage of officials received and read CASME project progress reports regularly, depending on a reporting period stipulated on each project's SLA. Again this augured well for CASME, as District Officials might spot areas where their hand was needed through reading the progress reports. It also meant that CASME impact levels were clearly visible, as progress reports stated what had been achieved and what possibly still remained as challenges for mathematics teachers of project schools. Reports also emphasised areas of attention for the mathematics teachers, to enable everyone who reads the reports to offer their support from their background.

An overwhelming expression of confidence in CASME by District Officials was also one big highlight indicating the remarkable strides CASME has made in Umlazi District. Such unanimous agreement (a total of 92% of all District Officials who completed the questionnaire) shows that the work of CASME is noticed and rated very highly by the Umlazi District Officials. Most of the District Officials who completed the questionnaire were Subject Advisers who occasionally sat in CASME-facilitated workshops and engaged in school visits with mathematics teachers who receive classroom support from CASME. This all renders their expressed confidence credible, and it deserves to be given high recognition. This expression of such confidence in CASME clearly stems from what they have seen in workshops and experienced in schools on their official school visits.

The research further found that all District Officials agreed, based on their expertise as Subject Advisers and Chief Education Specialists, that CASME facilitators possessed high-level knowledge of mathematics that they shared with project mathematics teachers. Therefore, this meant that CASME stood a big chance of influencing the content knowledge of project mathematics teachers. This also meant that pupils taught by the project mathematics teachers would then receive the best tuition and perform better in their assessments.

The fact that 100% of District Officials said that they would always prefer CASME to deliver mathematics teacher development programmes in their district of Umlazi suggests a strong positive correlation between the work of CASME and the kind of teacher they see in classrooms after attending CASME workshops and being supported in classrooms. It suggests deep recognition, by District Officials of the impact of CASME in the Umlazi District project schools. It is therefore undoubtedly clear that, in the eyes of the Umlazi District officials, CASME has done a tremendous job with its mathematics teachers in various projects.

Another point of unanimous agreement among Umlazi District Officials was that they will, without any shadow of a doubt, recommend CASME to other DBEs to implement similar projects to those in Umlazi District. Again, this augurs well for CASME as it also speaks to the evidently splendid work of CASME with Umlazi District mathematics teachers of project schools. It means that the impact of CASME is so positive that it befits escalating it to other districts in KZN Province.

On the last question posed to District Officials, about pupils' results, there were mixed feelings, with a greater percentage agreeing that they had confidence that pupil results in mathematics would improve because of CASME-implemented projects in Umlazi District. The reason for this may partly be due to exercising caution that not all teachers give 100% to the implementation of CASME-suggested ideas to improve mathematics results and also because pupils also have a personal role when it comes to the issue of results in mathematics – not only in this district, but in the whole country.

5.6 CASME's views on its impact in Umlazi District

CASME staff believed that there was a need to intervene in Umlazi District. CASME has information about Umlazi District's mathematics results for a good number of the previous years. It bases its target for support mainly on those results as well as the fact that this district was previously disadvantaged. No staff members of CASME felt that the intervention in Umlazi District was misdirected or misplaced. Although there were some 6% neutral opinions on the question of previously disadvantaged schools as targets of CASME, the 94% agreement was more than sufficient to establish CASME's overall target areas of intervention in an attempt to contribute towards improvement of mathematics achievements in SA.

The research found a significant split of feelings as to whether CASME had a tried-and-tested turnaround strategy for improving results in Umlazi District. The staff was evidently divided on this point, with a slightly greater percentage agreeing that the organisation had a sound turnaround strategy and about 22% opting to be neutral on this point. This can be attributed to the fact that results at Umlazi have not improved to a level that is satisfactory to CASME as per the mandate placed upon it by donors and funders. The research found this to be an inconsistency, because one would expect the organisation to continue to believe in its model of intervention regardless of the results that come through from schools, given that all staff members embraced its theory of change without a shadow of a doubt.

On an odd question that was asked, as to whether CASME has solutions to all SA's mathematics crises, a good number of staff agreed and a handful disagreed. It was expected that the organisation would not be regarded to have solutions to all mathematics crises of SA. However, the greatest percentage of staff seemingly expressed confidence in CASME as having some good suggestions that might be solutions to numerous mathematics challenges in the country.

CASME staff overwhelmingly agreed on the high calibre of the facilitators the organisation prepared, developed and maintained. However, a small percentage opted to be neutral on this question. It can be possible that some staff do not have the acumen to assess other facilitators' competence and knowledge of mathematics to classify them as world class and dynamic. Of course, Kirkpatrick's (2003) model of evaluating training effectiveness could well be followed after each training CASME staff members received as part of professional development that could make them world-class in facilitation ratings. This can therefore be linked to the impact of CASME in Umlazi District, as a positive correlation was found between CASME's work and the quality of project mathematics teachers' work as viewed by District Officials.

The research further found a significant split on the question of whether CASME produced world-class mathematics teacher development materials or not. Again, some CASME academic staff could have had limitations in making this judgement because of lack of expertise. The research also found a high amount (22%) of neutrality on this question. This again confirms some possible level of uncertainty about materials quality assurance by academic staff and/or management.

On the question relating to classroom support, CASME staff expressed a lot of confidence in their support of project mathematics teachers during classroom support visits. It should be recalled that District Officials also had confidence in behavioural changes noted in Umlazi District mathematics teachers in CASME-implemented projects. This confirms the value-add which the CASME classroom support menu brings to project teachers of mathematics. It implies that CASME has a positive impact on these teachers and that mathematics achievements are likely to go up steadily in this district in years to come.

The research focus remained within the context of teacher development in the area of mathematics, but could not exclude, in part, how CASME felt about its pupil programmes in some of its projects, (e.g. a Transnet Foundation-funded project rolled-out in 2013/2014). It was therefore still relevant to direct this question to CASME as the service provider in projects where a pupil tuition programme was in. CASME felt that they delivered best pupil tuition programmes, and that probably made them popular with project mathematics teachers as they ran Saturday afternoon clinics and school holiday classes with mathematics pupils of SLA-specified grades in the project schools.

As was expected, 89% of CASME staff felt that they delivered effective teacher workshops and best in-service development programmes to mathematics teachers of all projects in Umlazi District. This was supported by project mathematics teachers and District Officials, who also felt the same about the impact of CASME, as shown in their responses to relevant questions. Although 11% of CASME staff were neutral on this question, the strong positive correlation between mathematics teachers of the projects and the objective, positive view of District Officials about the calibre of these teachers after CASME intervention made this neutral stance insignificant.

Lastly, there was unanimous agreement among CASME staff members that mathematics teachers who had gone through their programmes in the projects had positively changed behaviour and their performance in classes had improved. This again is found to be consistent with the views of mathematics teachers themselves and the SMTs of project schools. A strong positive correlation is again noted between the CASME staff feelings and the view of District Officials about project teachers of mathematics in Umlazi District.

5.7 Conclusion

Projects' mathematics teachers agreed that CASME has made an impact on their lives in various ways. This was clearly observed in many of their responses to the questionnaire. The SMTs further echoed the same sentiments in relation to teachers of mathematics who have gone through CASME support programmes. However, lack of hands-on involvement on the part of Principals and Deputy Principals in terms of managing the projects within schools was glaring and worrisome.

In conclusion, project mathematics teachers have clearly indicated that the impact of CASME in their lives is that of leaving a good legacy. With all gains recognised and un sentimentally laid out above, one rounds up with some level of certainty that CASME has made a good impact on mathematics teachers of the project schools in Umlazi District. This is backed by the District Officials' views on CASME's work and the calibre of mathematics teachers of all projects rolled out by CASME in Umlazi District.

5.8 Summary

Projects mathematics teachers of Umlazi District are very pleased with the work of CASME in their workshops and during classroom support visits. Teachers have derived a lot of value from CASME programmes and have since seen improvements in their planning, lesson preparation, lesson delivery and assessment of pupils. Immediate supervisors of these teachers in the form of Principals and Deputy Principals echoed the same feelings as teachers of mathematics, that CASME was doing splendid work in the district.

District Officials also commented very positively about CASME's impact in Umlazi District. The comments on the quality of mathematics teachers who participated in CASME projects showed that District Officials have a lot of confidence in CASME and the impact of its programmes. The overall comments of the SGBs also spoke to awareness of mathematics crises in general and how they bank on CASME as providing solutions to the alarming challenges of mathematics achievements in the whole of SA.

CASME had a positive view of its work and understanding of the scale of the problem of mathematics achievements in Umlazi District and consequently in the country. This view was strongly shared by staff members in their responses on various questions, and in some cases they agreed unanimously. It was found that some CASME staff lack skills to make good judgements when it comes to CASME's model of intervention and turnaround strategy to improve mathematics achievements in Umlazi District.

CHAPTER 6: Conclusion and Recommendations

6.1 Introduction

This chapter concludes the research work undertaken in relation to the impact of CASME in Umlazi District of the DBE in KZN Province of SA. It concludes the findings of this dissertation. The conclusion was informed by analysis of the data in Chapter 4 and the discussion of results in the previous chapter. Chapter 5 provided the general opinion, from analysing responses of various stakeholders involved in this research, that CASME is making an impact on the project schools of Umlazi District.

This chapter will give a concluding summary in relation to the research question, as to whether or not CASME has impacted on the improvement of mathematics achievements in Umlazi District of KZN Province of SA.

6.2 Has the problem been solved?

Analysis of responses to the questionnaire about the “Impact of CASME support to schools to improve results in mathematics at Umlazi District, KZN Province in SA” led to the conclusion enumerated below. This conclusion links all four research objectives in an attempt to generalise in relation to the main research question as quoted above. To arrive at one resounding conclusion, critical points from stakeholder sectors were drawn and linked to the research objectives.

There was overwhelming agreement by all stakeholders that there was a need for intervention in Umlazi District. The District Officials overwhelmingly agreed that the district does not have adequate and suitably qualified mathematics teachers across all phases. CASME project mathematics teachers unanimously agreed to the fact that they had limitations in terms of CAPS interpretation and assessment issues. Lack of teaching and learning resources was also highlighted as hampering teaching and learning discourse.

It was therefore found that the level of impact of CASME in improving mathematics results in Umlazi District is so remarkable that not only project mathematics teachers – as direct beneficiaries of CASME support – but also SMTs and District Officials noticed positive changes in project mathematics teachers' behaviour and practices. It was found that project mathematics teachers displayed confidence after attending CASME workshops, in dealing with issues of planning in its entirety, assessment in all its forms, unpacking of CAPS and other indispensable DBE policies for effective teaching and learning in South African schools.

Good practices that yield good results in a mathematics teacher development project were elicited:

- Creating a platform for project mathematics teachers to raise troubling issues in their own teaching;
- sourcing ideas that work from CASME facilitators and other mathematics teachers;
- raising or heightening awareness of underlying policies; and
- implementation of such policies.

Unless all mathematics teachers have all relevant documents and are clear on the demands each document places on them, they will never be effective in their classes because their planning, delivery of lessons and assessment of effectiveness of their teaching will forever be misguided.

Analysis of responses considered from each stakeholder sector to assess the effectiveness of CASME's model of intervention in Umlazi District project schools showed overwhelming agreement. District Officials, for example, said they would strongly recommend CASME to other districts of KZN DBE that do not have such projects running. Project mathematics teachers said they would strongly recommend that other non-project mathematics teachers be taken through CASME's intervention programme because of the value they had derived from CASME's support. Such statements suffice to conclude that the model of intervention that CASME uses is undoubtedly effective.

The effectiveness of CASME workshops was further endorsed by the overwhelming confidence of the SMTs that CASME-implemented projects would improve mathematics pupils' attainments in their schools, as was solicited through the last question in the questionnaire.

The study further found that some of the underlying factors of poor performance in mathematics in Umlazi District are rooted in the shortage of suitably qualified mathematics teachers. This confirms the findings of the CDE about South African mathematics teachers, that they are not suitably qualified, most have only academic qualification and not professional qualification (CDE, 2011). Project mathematics teachers attested to this factor themselves backed by the District Officials in their respective questionnaires. Inadequate supply of teaching and learning resources like books were also cited quite boldly as a root cause of poor performance in mathematics in the district. Needless to say, if there is under-supply of books for pupils, there could therefore be no adequate supply of modern technology and powerful interactive mathematics software (CASME, 2012). All these constitute underlying factors of poor performance in mathematics in Umlazi District schools.

Given all these findings as was discussed at length in the previous chapter, it can be concluded that the question has been satisfactorily answered. This research has found that CASME has made significant positive impact in Umlazi District of KZN Province by supporting projects school mathematics teachers to improve the results in mathematics. CASME has done this through its clear and implementable model of intervention and forging strategic partnerships with all mathematics Subject Advisers of the Umlazi District in KZN DBE. The study found that CASME prides itself in its world-class facilitators and that it delivers effective mathematics teacher development programmes and best in-service development programmes to mathematics teachers of all projects in Umlazi District.

6.3 Implications of the research

This study, solely focused on the work of CASME, has never been done before. No research specific to CASME, as this, has been done. World renowned bodies like TIMSS, CDE and SACMEQ have openly raised issues and made suggestions of what could be solutions to the plight of mathematics attainment in SA. None of them have made emphasis on the work of NGOs and the impact they make on mathematics teachers for best pupil attainment in mathematics.

This study, therefore, has opened a new pathway of research in respect of mathematics achievements by focusing on the work of NGOs as they claim to have sound, practical and sensible solutions to the country's crisis of mathematics attainment. A new trend must be seen with growing interest in the work of NGOs and the models of intervention they use to support mathematics teachers for best pupil results. Most scholarly work that exists revolves around poor performance and reasons thereof. A new pathway must centre on the work of NGOs and their *modus operandi* in order to assist the DBE to set up a working strategy to develop the competence of all mathematics teachers of SA.

The study revealed that project mathematics teachers of Umlazi District valued very highly the contribution of CASME. This means there is an opportunity for NGO work to make a meaningful contribution to the plight of poor performance in mathematics in SA. This study has contributed to exposing another possible solution, namely that the South African Government can strengthen and form stronger partnerships with such NGOs in the fight against this challenge. More and more scholars can now take this forward to widen the research scope in order to reveal more of such NGOs and their work with mathematics teachers of SA.

This research work further implies that Umlazi District has the chance to share this support initiative with other districts of the KZN DBE. This can best be done by mathematics Subject Advisers of the district, because they stand a good chance of singling out all practices that make an impact on the pupil results and place emphasis on strategies that positively influence mathematics teachers' behaviour and confidence. As more and more of the work of NGOs gets such exposure, more and more of such practices can be shared within the country for the benefit of all mathematics pupils.

6.4 Recommendations to solve the research problem

A strong recommendation is made to CASME that they look at their staff's awareness of internal tools of trade, such as turnaround strategy, to improve mathematics results. If this aspect is allocated sufficient budget and research is undertaken to understand the reasons why some staff members are unable to make judgements on the effectiveness of their strategy, it will benefit CASME and the districts in which they intervene. If staff become clear on and fully embrace the organisation's turnaround strategy, they will best execute it on the field with mathematics teachers in various districts where CASME has projects running.

It must be noted that this research looked at the 'impact' of CASME in Umlazi District with a view to improving pupils' results. It must also be recollected that SGBs needed more time to complete their questionnaire because of language, as most of them are not fluent in English. To type up their questionnaire in the vernacular would have posed a translation challenge during analysis. It is therefore recommended that qualitative methods be used for SGBs in similar situations as that will facilitate analysis.

6.5 Recommendations for future studies

This study picked up a number of possible future research points on analysis and discussion of the data collected. Interested scholars might look at the following as possible research topics within this field:

1. This research looked at the whole package of CASME's mix in their toolbox. Research that follows could be better if narrowed down to only one item in the toolbox, for example: Impact of classroom support on project mathematics teachers.
2. The focus could also be restricted to either high schools or primary schools mathematics intervention projects.
3. Gender: The same topic could be improved by analysis of opinions of males and females.
4. Research could also look at the guiding tools for SMTs to support and stringently monitor the work of NGOs at school level.
5. Future research could consider translation into 'improved pupil attainment' as opposed to focusing only on mathematics, as other NGOs impact on other learning areas.

6. District support to NGO work could also be researched as an independent study, with a view to investigating the strength of partnership between NGOs and the District Officials.
7. Qualitative research on this same topic would give the researcher good information from respondents around many assumed reasons in the case of the quantitative research method.

6.6 Summary

This chapter has concluded the research topic. The study was educating in the sense that not many scholars vest interest in NGO work in the context of this research question. It was found that CASME makes a positive impact in Umlazi District. There is a need to focus more on such NGOs' work with a view to assisting the DBE to improve mathematics achievements in SA. Research institutions like TIMSS and CDE could extend their scope of research around poor performance in mathematics by looking further into the work of NGOs such as CASME. These are therefore the implications for future research purposes.

The research found that CASME has a positive impact on the project mathematics teachers of Umlazi District. It further found that District Officials have seen value in partnerships with NGOs such as CASME and are supporting these interventions fully.

There were a number of unintended outcomes that led to possible future research questions, as is the case with most research activities. These are enumerated for interested readers of this dissertation to take those study topics forward. In the same vein, issues that need to be thought of carefully in future were identified, for example, how inclusion of SGB members to participate in such an academic activity poses challenges around interpretation.

References

- Alias, M. 2005. Assessment of learning outcomes. *World Transactions on Engineering and Technology Education*, 4(2), pp. 235-238.
- Anderson, A & Martin, M, 2007. Outcomes Based Education. *Where has it come from and where is it going?*, 17(2), pp. 161-182.
- Argyrous, G. 2011. *Statistics for research: Qualitative, Quantitative and Mixed Methods Approaches*. 3rd ed. United Kingdom: London: Sage publications.
- Bloch, G. 2009. In a Fix Over Toxic Mix. *Three Futures For Education*, 30 November, p. 3.
- Block, G. 2009. In A Fix over Toxic Mix. *Three Futures for Education*, 30 November, p. 3.
- CASME, 2012. *BHP Billiton Gauteng GET project*, Pinetown: Casme.
- CASME, 2013. *Transnet Foundation Monthly report: October 2013*, Pinetown: Casme.
- CDE, 2009. *Perceived Lack of Safety in South African schools*. Cape Town, Via Afrika.
- CDE, 2011. *Suitability of South African Mathematics Teachers to Teach Maths*, Pretoria: Online.
- Cho, M. 2010. *A comparison of the effectiveness of mathematics and science education in Korea and South Africa: a multilevel analysis of TIMSS 2003 data*, Phd Thesis., Pretoria: University of pretoria.
- Clarke, D. 2001. *Understanding, assessing and developing young children's mathematical thinking*. Syney, MERGA conference, pp. 11-29.
- Cohen, L & Morrison, K. 2007. *Research Methods in Education*. 5 ed. London: Routledge falmer.
- Education, D. O. B. 2010. *National Department of Education: South African Schools Act*. [Online]
Available at: <http://www.education.gov.za>
[Accessed 15 December 2014].
- Education, D. O. B. 2011. Improving quality of learning and teaching. *Curriculum News*, 2(1), pp. 5-12.
- Education, G. D. 2010. *Improved Schools*. , Johannesburg: Gauteng DBE.
- Elmore, R., 2004. *School reform from the inside out*. 2nd ed. Cambridge Mass: Harvard University Press.
- Fetler, M. 2001. Student Mathematics Achievement tests scores, dropout rates, and teacher characteristics. *Teacher Education Quarterly*, 28(1), pp. 151-168.
- Fleish, B. 2008. *Primary education in crisis: why South African school children underachieve in reading and mathematics*. Cape Town: Juta.

- Garson, G. 2014. 'Valid Statistical'. *International Encyclopidia of the Social Sciences*, 16(4), pp. 12-15.
- Glasow, D. 2005. *Funadamentals of survey research methodology*. 2nd ed. Washington: Mitre production.
- Goldhaber, D. Brewer, D. 2000. Does teacher certification matter?. *Education Evaluation and Ploicy Analysis*, 22(1), pp. 128-145.
- Goldhaber, D. Brewer, D. 2009. Education Achievements and Teacher Qualifications: New evidence from micro level data. *Advances in Education Productivity*, 6(2), pp. 243-264.
- Greenward, R. Hedges, LV. Laine, RD, 2005. The effect of school resources on student achievements. *Review of education research*, 66(3), pp. 361-382.
- Gustafsson, M. 2005. *The relationships between schooling inputs and outputs in South Africa: methodologies and policy recommendations based on the 2000 SACMEQ results..* Paris: Paper presented at the SACMEQ International Invitational Education Policy Reasearch Conference.
- Hanushek, E. 2009. Throwing money at schools. *Journal of Policy Analysis and Management*, 11(4), pp. 19-41.
- Hobden, P. Hobden, S. 2013. *Differentiated Academic Support Research Project*, Durban: The Hobdens.
- Howie, S. 2005. Contextual factors at the school and classroom level related to pupil's performance. *Studies in Educational Evaluation*, 11(2), pp. 123-140.
- Howie, S. 2006. *Multi-level factors afftecting the performance of South African pupils in mathematics*. London, Routeledge & Francis group.
- Jansen D. 2010. *The language of research*. Pretoria, Van Schaik Publishers.
- Jansen, J. 2008. Curriculum reform in South Africa. *Cambridge Journal of Edcation*, 28(3), pp. 321-327.
- Jansen, J. 2013. *Ten tips for parents taking their children to schools*, Bloemfontein: UFS.
- Jeanie, K. 2005. Teacher Professional Development. *Professional development*, 30 october, pp. 9-12.
- JIPSA, DOC. 2009. *Scarce skills in South Africa*, Cape Town: Office of the Deputy President.
- Kahle, 2005. *Professional Development and Training*, Pretoria: Kahle Media.
- Kaufman, 2011. *Training effectiveness*, New York: Read How You Want.
- Kirkpatrick D L; Kirkpatrick J, 1994. *Evaluating training programs*. 1st ed. New York: Read How You Want.
- Kirkpatrick, D. L., 2003. *Training evaluation programs*. 3rd ed. New York: s.n.

- Kriek, J & Grayson, D, 2009. A Holistic Professional Development model for South African mathematics teachers. *South African Journal of Education*, 29(2), pp. 7-8.
- Kriek, J; Grayson, DJ, 2008. Initial development of a holistic model for Mathematics teacher development. *Paper presented at the 3rd Conference on Science, Mathematics and Technology Education*, 3(1), pp. 11-14.
- Kyle Jr, W., 2005. The Growth and Learning of Teachers as Professionals over Time. *Professional Development*, 2(1), pp. 23-24.
- Lokan, J & Greenwood, L, 2004. Mathematics Achievements at Secondary Level. *Studies in Educational Evaluation*, 26(1), pp. 41-50.
- Lokheed, M.E & Verspoor, A.M, 1999. *Improving primary education in developing countries*, Oxford: Oxford university press.
- Lupton, R., 2004. *Schools in disadvantaged areas: Recognising context and Raising quality*. [Online]
Available at: <http://www.ssrn.com/abstract id=1158967>
[Accessed 28 November 2014].
- Makuwa, D., 2010. *SACMEQ Policy issues Series: What are levels and trends in reading and mathematics achievements?*. [Online]
Available at: www.sacmeg.org
[Accessed 28 November 2014].
- Metcalfe, P. M., 2014. *Jika iMfundo*, Pietermaritzburg: KZN DBE.
- Moloi, P. Straus A, 2005. *A Comparative Study of Mathematics Achievements*. 1st ed. Cape Town: McMillan.
- Prof P Hobden & Dr S Hobden, 2013. *Differentiated Academic Support Research Project*, Durban: The Hobdens.
- Reddy, B., 2006. *State of Mathematics Achievements in Developing Countries*. 2 ed. Cape Town: McMillan.
- Taylor D. Moyana, C. 2005. *Quality Learning Project*, JHB: JET.
- TIMSS, 2011. Mathematics Attainments in South Africa. *TIMSS Rankings*, (4), p. 23.
- Trust, J. E. 2010. *Zenex Izibalo Project*, Cape Town: Evaluators.



20 November 2014

Mr Henry Mbongiseni Gumede 212547262
Graduate School of Business and Leadership
Westville Campus

Protocol reference number: HSS/1431/014M
Project title: Impact of CASME support to schools to improve results in mathematics at Umhlab District, KZN province
in South Africa.

Dear Mr Gumede

Expedited Approval

In response to your application dated 19 November 2014, the Humanities & Social Sciences Research Ethics Committee has considered the abovementioned application and the protocol have been granted **FULL APPROVAL**.

Any alteration/s to the approved research protocol i.e. Questionnaire/Interview Schedule, Informed Consent Form, Title of the Project, Location of the Study, Research Approach and Methods must be reviewed and approved through the amendment/modification prior to its implementation. In case you have further queries, please quote the above reference number.

Please note: Research data should be securely stored in the discipline/department for a period of 5 years.

The ethical clearance certificate is only valid for a period of 3 years from the date of issue. Thereafter Recertification must be applied for on an annual basis.

I take this opportunity of wishing you everything of the best with your study.

Yours faithfully



Dr Sheelika Singh (Chair)

cc Supervisor: Mr Christopher Chikandwa
cc Academic Leader Research: Dr B Mungapu
cc School Administrator: Ms Zolene Buliyi

Humanities & Social Sciences Research Ethics Committee

Dr Sheelika Singh (Chair)

Westville Campus, Govan Mbeki Building

Postal Address: Private Bag X04001, Durban 4001

Telephone: +27 (0) 31 261 4661 Fax: +27 (0) 31 261 4661 Email: applied@uqn.ac.za / ethics@uqn.ac.za / ethics@uqn.ac.za

Website: www.uqn.ac.za



**UNIVERSITY OF KWAZULU-NATAL
GRADUATE SCHOOL OF BUSINESS & LEADERSHIP**

MBA Research Project 2014

Researcher: Mbongiseni Gumede (072 245 3575)

Supervisor: Christopher Chikandiwa (031-260 1615)

Research Office: Ms P Ximba 031-2603587

Title of Survey

Impact of CASME support to schools to improve results in mathematics at Umlazi District, KZN province in South Africa.

The purpose of this survey is to solicit information from CASME, Umlazi District of basic education officials, principals, teachers and school governing body members regarding mathematics teacher development projects implemented by CASME at Umlazi District schools. The information and ratings you provide us will go a long way in helping us identify impact of CASME projects in Umlazi District schools. The questionnaire should only take **10 - 15** minutes to complete. In this questionnaire, you are asked to indicate what is true for you, so there are no “right” or “wrong” answers to any question. Work as rapidly as you can. If you wish to make a comment please write it directly on the booklet itself. Make sure not to skip any questions.

Thank you for participating.

FOR MBA DISSERTATION PURPOSE

Mbongiseni Gumede (212547262): UKZN 2014

CASME is an abbreviation that stands for the Centre for Advancement of Science and Mathematics Education. It is an NPO that does mainly teacher development programmes in science and mathematics disciplines. CASME is 29 years old to date, first established in 1985.

Research objective:

1. To assess level of impact of CASME in improving mathematics achievements at Umlazi district of basic education.
2. To elicit good practices that yield results in a mathematics teacher development project.
3. To assess effectiveness of CASME's model of intervention at Umlazi district projects schools.
4. To investigate the underlying factors of poor performance in mathematics in Umlazi district schools.

Research questions:

1. How does CASME influence improvement in mathematics achievements in Umlazi district of basic education?
2. What are good practices that CASME share with the Umlazi district projects teachers in order to improve their competence in the teaching of mathematics?
3. How do critical stakeholders view CASME support in the project schools of Umlazi district?
4. What are the main factors that cause poor performance in mathematics in Umlazi district schools?

QUESTIONNAIRE

This questionnaire is confidential between all those that complete it and the researcher. Only the mentioned stakeholders are allowed to complete this questionnaire under relevant section. This questionnaire applies to all previous and current project rolled-out by CASME within Umlazi district of basic education. It cuts across primary schools to secondary and high schools.

NB: Please complete only the section relevant to you and leave all other sections that do not relate to you blank. For confidentiality reasons, this questionnaire will not be given to any other person after you have completed section that relates to you! Complete this form by making an (X) on your choice or response per question. Where appropriate 1 = very poor and 5 = Excellent!

To guide you further, if you are:

Stakeholder	complete	On page
CASME official	Section A only	3-4
Umlazi district official	Section B only	5
Principal/Dep. principal	Section C only	6
Mathematics teacher	Section D only	7-10
SGB member	Section E only	11

SECTION A

CASME

This section must be completed by all CASME management and mathematics facilitators.

1. There is a need to intervene in Umlazi district of basic education schools to improve mathematics achievements/performance?

Strongly disagree	disagree	Neutral	agree	Strongly agree
-------------------	----------	---------	-------	----------------

2. The target group is always previously disadvantaged schools of Umlazi district of basic education.

Strongly disagree	disagree	Neutral	agree	Strongly agree
-------------------	----------	---------	-------	----------------

3. CASME has tried and tested turnaround strategy for improving results in Umlazi district of basic education.

Strongly disagree	disagree	Neutral	agree	Strongly agree
-------------------	----------	---------	-------	----------------

4. CASME has solutions to SA mathematics achievements crisis / challenges.

Strongly disagree	disagree	Neutral	agree	Strongly agree
-------------------	----------	---------	-------	----------------

5. CASME has world class and dynamic facilitators that work with mathematics teachers of the project schools in Umlazi district.

Strongly disagree	disagree	Neutral	agree	Strongly agree
-------------------	----------	---------	-------	----------------

6. CASME produce world class teacher development materials that teachers can use for own professional development.

Strongly disagree	disagree	Neutral	agree	Strongly agree
-------------------	----------	---------	-------	----------------

7. CASME provides world class classroom teacher support in all project schools at Umlazi district.

Strongly disagree	disagree	Neutral	agree	Strongly agree
-------------------	----------	---------	-------	----------------

8. CASME provides best tuition programmes to project learners where learner programme is built to the project deliverables in the service level agreement.

Strongly disagree	disagree	Neutral	agree	Strongly agree
-------------------	----------	---------	-------	----------------

9. CASME delivers effective teacher workshops and best in-service development programmes to mathematics teachers of all projects in Umlazi district.

Strongly disagree	disagree	Neutral	agree	Strongly agree
-------------------	----------	---------	-------	----------------

10. CASME delivers teachers training / development programmes that positively affect behaviour and performance of Umlazi district teachers on their job.

Strongly disagree	disagree	Neutral	agree	Strongly agree
-------------------	----------	---------	-------	----------------

SECTION B

Umlazi District official

This section must be completed by Umlazi district director, circuit managers, ward managers and mathematics subject advisors within this district of basic education.

1. Do you have enough maths teachers within Umlazi district of basic education?

Strongly disagree	disagree	Neutral	agree	Strongly agree
-------------------	----------	---------	-------	----------------

2. Are there crisis / challenges regarding teaching and learning of mathematics within Umlazi district of basic education?

Strongly disagree	disagree	Neutral	agree	Strongly agree
-------------------	----------	---------	-------	----------------

3. Do you provide necessary support to CASME implemented projects?

Strongly disagree	disagree	Neutral	agree	Strongly agree
-------------------	----------	---------	-------	----------------

4. Do you have full knowledge of all schools with CASME implemented projects within Umlazi district of basic education?

Strongly disagree	disagree	Neutral	agree	Strongly agree
-------------------	----------	---------	-------	----------------

5. Do you regularly receive and read thoroughly all CASME reports for progress in project schools within Umlazi district of basic education?

Strongly disagree	disagree	Neutral	agree	Strongly agree
-------------------	----------	---------	-------	----------------

6. Do you have confidence in relation to the support provided by CASME to mathematics teachers of all project schools within Umlazi district?

Strongly disagree	disagree	Neutral	agree	Strongly agree
-------------------	----------	---------	-------	----------------

7. Do you have confidence in relation to the knowledge CASME facilitators have that they share with projects teachers within Umlazi district?

Strongly disagree	disagree	Neutral	agree	Strongly agree
-------------------	----------	---------	-------	----------------

8. You will always prefer CASME to implement projects in this district of basic education.

Strongly disagree	disagree	Neutral	agree	Strongly agree
-------------------	----------	---------	-------	----------------

9. You can recommend CASME to other districts of basic education.

Strongly disagree	disagree	Neutral	agree	Strongly agree
-------------------	----------	---------	-------	----------------

10. You have confidence and know that mathematics results will improve / have improved in the schools that receive CASME support in Umlazi district.

Strongly disagree	disagree	Neutral	agree	Strongly agree
-------------------	----------	---------	-------	----------------

SECTION C

Principal or deputy principal

This section must be completed by all principals or deputy principals of the previous and current CASME implemented projects in Umlazi district of basic education.

1. How well do / did you know and understand / understood the objectives of CASME implemented project at your school?

1	2	3	4	5
---	---	---	---	---

2. How well do / did you know your specific role in the roll-out of this project at your school?

1	2	3	4	5
---	---	---	---	---

3. How well do / did you monitor mathematics teachers' progress with this CASME implemented project?

1	2	3	4	5
---	---	---	---	---

4. Do /did you receive regular feedback from HOD about progress in CASME implemented project at your school?

never	seldom	sometimes	often	always
-------	--------	-----------	-------	--------

5. Do / did you read and reflect on CASME's reports that they write about progress in this project?

never	seldom	sometimes	often	always
-------	--------	-----------	-------	--------

6. Do /did you have confidence that this CASME implemented project will improve mathematics learner attainment in your school?

Y	N
---	---

SECTION D

Mathematics teacher

This section must be completed by all previous and current CASME implemented projects teachers of mathematics in Umlazi district of basic education.

1. Have you previously been involved or currently involved in CASME implemented teacher development project for mathematics teachers?

Y	N
---	---

2. Are you suitably qualified to teach mathematics at the phase you teach currently

Y	N
---	---

3. Do you have access to the following documents?

3.1 CAPS document for mathematics

Y	N
---	---

3.2 Assessment policy for mathematics

Y	N
---	---

3.3 Personal weekly or cycle time-table

Y	N
---	---

3.4 Mathematics grade specific work schedule

Y	N
---	---

3.5 Mathematics grade specific pace setter

Y	N
---	---

4. Do you always cover the grade specific mathematics curriculum in full in any given curricular year?

Y	N
---	---

5. Rate your planning in the following aspects:

5.1 Termly work planning

1	2	3	4	5
---	---	---	---	---

5.2 planning for daily teaching

1	2	3	4	5
---	---	---	---	---

5.3 planning for assessment

1	2	3	4	5
---	---	---	---	---

6. Rate how you prepare for high cognitive engagement during your mathematics lesson delivery in class?

1	2	3	4	5
---	---	---	---	---

7. Rate how you incorporate principles underlying mathematics procedures in your daily lesson preparation and delivery.

1	2	3	4	5
---	---	---	---	---

8. Rate the quality of assessment you formulate and give to your learners?

1	2	3	4	5
---	---	---	---	---

9. Rate how you give explicit feedback after you have marked learner assessments?

1	2	3	4	5
---	---	---	---	---

10. Rate how you make use of learner errors to provide explicit feedback after you have marked assessment.

1	2	3	4	5
---	---	---	---	---

11. Indicate whether your learners read maths in the following categories:

11.1 From books

Strongly disagree	disagree	Neutral	agree	Strongly agree
-------------------	----------	---------	-------	----------------

11.2 On charts

Strongly disagree	disagree	Neutral	agree	Strongly agree
-------------------	----------	---------	-------	----------------

11.3 On the chalkboard

Strongly disagree	disagree	Neutral	agree	Strongly agree
-------------------	----------	---------	-------	----------------

11.4 As individual

Strongly disagree	disagree	Neutral	agree	Strongly agree
-------------------	----------	---------	-------	----------------

11.5 As pairs

Strongly disagree	disagree	Neutral	agree	Strongly agree
-------------------	----------	---------	-------	----------------

11.6 As groups

Strongly disagree	disagree	Neutral	agree	Strongly agree
-------------------	----------	---------	-------	----------------

11.7 As a whole class

Strongly disagree	disagree	Neutral	agree	Strongly agree
-------------------	----------	---------	-------	----------------

12. Indicate the magnitude of how your learners write maths under the following categories:

12.1 On exercise books as classwork

never	seldom	sometimes	often	always
-------	--------	-----------	-------	--------

12.2 Completing learning journals

never	seldom	sometimes	often	always
-------	--------	-----------	-------	--------

12.3 On tests

never	seldom	sometimes	often	always
-------	--------	-----------	-------	--------

12.4 As assignments

never	seldom	sometimes	often	always
-------	--------	-----------	-------	--------

12.5 As homeworks

never	seldom	sometimes	often	always
-------	--------	-----------	-------	--------

13. Do you have enough books for all your learners?

Y	N
---	---

14. Are you satisfied with the quality of books you use with your learners?

Y	N
---	---

15. Do you observe teaching time table and honour all reflected lessons/periods?

Y	N
---	---

16. You enjoy / enjoyed attending CASME facilitated workshops.

Strongly disagree	disagree	Neutral	agree	Strongly agree
-------------------	----------	---------	-------	----------------

17. You always benefit / benefited from attending CASME facilitated workshops.

Strongly disagree	disagree	Neutral	agree	Strongly agree
-------------------	----------	---------	-------	----------------

18. You can recommend CASME workshops to other mathematics teachers that have never attended CASME workshops.

Strongly disagree	disagree	Neutral	agree	Strongly agree
-------------------	----------	---------	-------	----------------

19. Your practices as a mathematics teacher have changed positively because of attending CASME workshops.

Strongly disagree	disagree	Neutral	agree	Strongly agree
-------------------	----------	---------	-------	----------------

20. You are more competent in your job as a mathematics teacher because of attending CASME workshops.

Strongly disagree	disagree	Neutral	agree	Strongly agree
-------------------	----------	---------	-------	----------------

21. Your classroom practices have changed positively because of CASME classroom support.

Strongly disagree	disagree	Neutral	agree	Strongly agree
-------------------	----------	---------	-------	----------------

22. Your lesson delivery has become more effective and reflective because of CASME demonstration lessons.

Strongly disagree	disagree	Neutral	agree	Strongly agree
-------------------	----------	---------	-------	----------------

23. Your assessment criteria and content have improved because of CASME coaching and mentoring.

Strongly disagree	disagree	Neutral	agree	Strongly agree
-------------------	----------	---------	-------	----------------

24. Your feedback to the learners after each assessment has become more informing and meaningful to your learners because of CASME coaching and support.

Strongly disagree	disagree	Neutral	agree	Strongly agree
-------------------	----------	---------	-------	----------------

25. You will always welcome support that come from CASME.

Strongly disagree	disagree	Neutral	agree	Strongly agree
-------------------	----------	---------	-------	----------------

SECTION E

SGBs – on behalf of parents

This section must be completed by at least 1 member of the school governing body members who is not a teacher (from the parents' body) in this school.

1. Are / were you aware of CASME implemented project for improving mathematics at the school where your children are enrolled?

Y	N
---	---

2. Do you think there is / was a need for such an intervention / support given to mathematics teachers at this school?

Y	N
---	---

3. Do you have confidence that this project will improve / improved mathematics results at this school?

Y	N
---	---

4. Do / did you receive and read CASME reports about progress in this project?

Y	N
---	---

5. Do / did you have confidence that the school is benefiting from participating in this CASME implemented project?

Y	N
---	---

End of the Questionnaire

Thank you for taking the time to complete the questionnaire.