CHAPTER FIVE
DISCUSSION OF FINDINGS

5.0 Introduction

This chapter discusses the findings of the study according to the objectives which were to investigate if pupils at high school hold positive beliefs concerning their own self efficacy in mathematics; to find out if there is a difference between higher and low achievers in terms of mathematics self efficacy and to investigate if there is a significant association between pupils level of mathematics self efficacy and their performance.

According to the concept of self efficacy, Pupils obtain information to appraise their self efficacy from their past performance, vicarious experience, persuasion they receive from others and their physiological and emotional reactions. Self efficacy has influence on choice of tasks, effort, persistence, resilience and achievement. Understanding of mathematics, acquiring of mathematical understanding, solving of mathematical problems and subsequently good performance depends partly on the belief that one is capable of constructing mathematical formulae, understanding mathematics, acquiring mathematics understanding and solving of mathematical problems. As well as viewing mathematics as an expanding field of human invention which is dynamic and problem- driven, structured, unchanging body of knowledge. Lastly, mathematics should be viewed as a collection of procedures, facts and skills.
Success in mathematics depends on ones resilience, effort and persistence. Efficacy to perform better in mathematics depends on the pupils past performance and the experiences s/he has undergone, influence from others as well as her/his physiological reactions. It also depends on ones behaviour, personal factors and the environment.

5.1 Positive Mathematics Self Efficacy Beliefs

As stated in the introduction in this chapter, the first objective of this study was to investigate if pupils at high school hold positive beliefs concerning their own self efficacy in mathematics. The findings of the research showed a variation in the level of self efficacy in the pupils with a good number of pupils having a medium level of positive mathematical self efficacy. Those pupils who had high mathematical self efficacy performed better except in the last question on the examination paper. Additionally the study showed that some pupils can have very high self efficacy but very poor performance. The failure by the pupils to do the last question on the test paper might be an indication that pupils had a low self efficacy. Had they had high self efficacy, they would have persisted and strived to get an answer. This is in line with what Gray (1994) says that persistence also depends on the skill to use goals and accomplishments, motivation, their patterns and emotional reactions.

From this research the teachers interviewed mentioned culture, teachers’ textbooks and the policy as the main determinants in the fostering of either
positive or negative mathematical self efficacy beliefs. It has also been mentioned that, Continuous Professional Development (CPD) programme for teachers is good.

Furthermore, the study showed that the pupils in the three schools complete their exercises and practice what they have learnt. From this result it was deduced that pupils who believe in themselves, that they can do a piece of work no matter what it takes usually complete their exercises and practice what they have learnt. However, these were just two out of twenty-three self efficacy items that the research was all about.

It was also found that a good number of the pupils were not working in groups and never discussed mathematical problems with a new classmate. This might be due to the way our culture is oriented. In most cultures, it is unacceptable to just meet a person for the first time and start interacting with that person freely. However, there are advantages and disadvantages of working in groups and discussing mathematics problems with a new classmate. The advantages are that, when pupils work in a group, they develop improved communication and negotiation skills, and better understanding as well as critical thought and deeper learning through debate. Pupils working in groups reflect on their learning and are more able to externalize their thought processes as well as helping others to understand the content.
The disadvantages are that, research on group assessment has shown that many group tasks fail to deliver on these skills, in particular the opportunity for the development of active debate and critical reflection. Too often, both mathematics education and teacher education tasks allow for inequitable contributions and for dominance by one or two individuals to occur (Nightingale et al., 1996, Ramsden, 2003) cited by Watson & Beswick .eds. (2007).

The advantage of discussing mathematics problems with a new classmate is that pupils that have other classmates to discuss the content they are engaging seem to comprehend more easily the tasks or skills necessary for successful learning. The disadvantage is that, pupils with no grade level classmates to discuss content seem to struggle more than students with classmates to discuss with.

Furthermore, in the research which was summarized by National research council of the United State of American (2005) it was emphasized that, it is important that pupils communicate about mathematics, and teachers should help them to do so. This is because pupils can learn to reflect on and describe their mathematical thinking. They can learn to compare methods of solving a problem and identify the advantages and disadvantages of each. Peers can learn to ask thoughtful questions about other pupils thinking or help edit such statements to clarify them. Pupils can learn to help each other, sometimes in informal, spontaneous ways and sometimes in more organized, coaching-partner situations. Experience in children’s mathematics worlds’ project indicates that
students from all backgrounds can learn to think critically and ask thoughtful questions, reflect on and evaluate their own achievement, justify their points of view, and understand the perspectives of others. Even first-grade students can learn to interact in these ways.

The study also showed a high "yes" verbal response prior to writing the test. Verbally all pupils responded that they could do all the questions in the test paper correctly without any mistakes. But this response should not be taken seriously because it is typical of many pupils to answer like that without thinking about the consequences of their response. Furthermore, believing in ones abilities is one thing but truly having these abilities is another. Therefore one needs the competencies that are the skill and abilities used for solving problems.

5.2.1 Difference between Higher and Lower Achievers In Terms Of Perceived Mathematics Self Efficacy

The second objective was to find out if there is a difference between higher and low achievers in terms of mathematics self efficacy. From this research it came out that there is a significant difference between higher and lower achievers in terms of perceived mathematical self efficacy. The study also showed that, some pupils can have high mathematical self efficacy, but with very poor performance, while other pupils have their mathematical self efficacy equal to their performance.
This difference might be because low achievers in mathematics classes may have no reason to enjoy their class-time, being unable to comprehend of the purposes of tasks, or unable to complete tasks that serve to reinforce the lack of relevance of much of mathematics to their lives. While individuals with high self-efficacy frequently persevere despite difficult tasks or challenging odds and often succeed because perseverance usually results in a successful outcome. (Bandura, 1986; 1997). This result is also in line with Cheng and Westhood (2009) who detected a significant of $p<0.05$ which showed that higher achieving children held more positive beliefs in mathematics than other children.

5.3 Relationship between Pupils Performance in Selected Topics and Their Mathematics Self Efficacy

The last objective was to investigate if there is a significant association between pupils level of mathematics self efficacy and their performance. From this research, the correlation was positive. This was an indication that there was a significant positive relationship between pupil’s performance in the five topics selected and their mathematical self efficacy. However, the teachers said that there is no relationship between the two variables. There was a lot of finger-pointing among the stakeholders. All the teachers seemed to be running away from the problem. In spite of what the teachers said some pupils said that there is a relationship between the two variables while others said there is not. Most of the pupils thus, 57 out of 81 (70%) said there is a relationship, others said no thus, 12 out of 81 (15%) while 10 out of 81 (10%) were not sure. Pupils’ defined
mathematical self efficacy correctly, gave out the sources of mathematical self efficacy and how it can be improved.

Additionally, the study showed high marks on the previous test which did not correlate with the current performance. Unprepared ness is one of the reasons that were given by the three teachers. But one fails to understand how unprepared ness can come in when most pupils responded positively to the questionnaire. This was an indication that pupils were observing and doing all the positive things involved in the learning and understanding of mathematics although there was a variation in their mathematics self efficacy belief. What can be deduced from this result might be what Haambokoma (2004) warned upcoming researchers that, some pupils might be unrealistic when responding to the questionnaire and that they might be responding in such a manner just to impress the researcher. Additionally, West (1959:419) says that, whether people carry out various actions depends substantially on both their expectancies and expectations relevant to the desired outcomes and their competencies to perform the behaviour that would solve their problems or achieve their goal.

The last question on the exam paper was attempted by very few pupils. To be specific only three boys out of eighty-one pupils attempted the question. And those who attempted it did not get it right. This question involved analyzing, synthesizing and evaluating apart from just simple recall of facts and formulae. What comes to the researchers mind is that pupils are just comfortable with
questions set at knowledge and partially comprehension level or there was disorientation from what pupils are used to. Additionally those pupils who never attempted the question might be lacking persistence and resilience. And, yet, the concept of self-efficacy encourages pupils to be resilient and persistence when they are faced with challenging problems. Furthermore, it contradicts what was claimed by the teachers earlier on that, pupils had done all the topics and that all were understood.

The researcher feels that pupils did not understand the mathematical concepts but just memorised for the sake of passing the examinations. Had they understood the previous concepts, they would not have been a mismatch between their past performance and the present performance.
CHAPTER SIX

SUMMARY, CONCLUSION AND RECOMMENDATIONS

6.0 Introduction

This chapter presents conclusions and recommendations drawn from the findings of the study. The study sought to find out if there was a relationship between self efficacy and mathematics performance among grade 11 pupils; to investigate if pupils at high school hold positive beliefs concerning their own self efficacy in mathematics and to find out if there is a difference between higher and low achievers in terms of mathematics self efficacy. The conclusion concentrates on the core findings based on the objectives of the study.

6.1 Major Findings

The study showed a significant positive relationship between pupil’s performance in the five topics selected and their mathematical self efficacy. However the findings of the research showed a variation in the level of self efficacy in the pupils with a good number of pupils having a medium level of positive mathematical self efficacy. Those pupils who had high mathematical self efficacy performed better except in the last question on the examination paper. It also showed that some pupils can have very high self efficacy but very poor performance. Furthermore, the current study showed that the pupils in the three schools complete their exercises and practice what they have learnt. From
this result it was deduced that pupils who believe in themselves that, they can do a piece of work no matter what it takes usually complete their exercises and practice what they have learnt.

It also was found that a good number of the pupils were not working in groups and never discussed mathematical problems with a new classmate. Verbally all pupils responded that they can answer all the questions in the test paper correctly without any mistakes. But this response should not be taken seriously because it is typical of many pupils to answer like that without thinking about the consequences of their response. Furthermore, from this research it came out that there is a significant difference between higher and lower achievers in terms of perceived mathematical self efficacy.

The study also showed that some pupils can have high mathematical self efficacy, but with very poor performance, while other pupils have their mathematical self efficacy equal to their performance.

6.2 Summary of the major findings

- There was variation in the way pupils perceived their self efficacy
- There was a difference between higher and lower achievers in terms of self efficacy
- There was an association between self efficacy and mathematics performance.
6.3 Conclusions of the study

The study sought to investigate if pupils at high school hold positive beliefs concerning their own self efficacy in mathematics; to find out if there is a difference between higher and low achievers in terms of mathematics self efficacy; to investigate if there is a significant association between pupils level of mathematics self efficacy and their performance in mathematics.

According to the self efficacy concept, human achievement depends on interactions between ones behaviours, personal factors (for example, thoughts, beliefs), and environmental conditions (Bandura, 1986, 1997) cited by (Fours, 2009). Pupils obtain information to appraise their self efficacy from their past performance, vicarious experience, persuasion they receive from others and their physiological and emotional reactions. Self efficacy has influence on choice of tasks, effort, persistence, resilience and achievement.

From this study, it came out that, some pupils understood what it meant to be mathematically self efficant as they were able to define it, give examples, sources of information and ways of improving it. Although, other pupils did not know what it meant to be mathematically self efficant.

The study also found that there is a variation in the level of self efficacy in the pupils with a good number of pupils having a medium level of positive mathematical self efficacy. Additionally, it was found that a good number of the
pupils were not working in groups and never discussed mathematical problems with a new classmate but were completing the exercises and practicing what they had learnt. Furthermore, the question which involved analyzing, synthesizing and evaluating was not attempted by most pupils. This was an indication that pupil were not persistence and resilient in face of obstacles. Pupil who had high mathematical self efficacy performed better except in certain cases like the last question on the test paper. Culture, government policy, teachers and textbooks are the main determinant in the inculcation of either positive or negative mathematical self efficacy belief. Earth geometry was cited as a challenge to both pupil and teacher mathematical self efficacy. However, the correlation was positive. This was an indication that there was a relationship between self efficacy and mathematics performance.

From this research, it was found that, there is a significant difference between higher and lower achievers in terms of perceived mathematical self efficacy.

6.4 Recommendations

Based on the findings of the study, the following recommendations are suggested.

The Ministry of Education should ensure that Society is sensitized on the importance of inculcating positive mathematics self efficacy beliefs in the children. This can be done by exposing pupils to live or symbolic role models, performance exposure, self instructed performance and performance
sensitization (a process through which aversive behaviour is paired with pleasant or relaxing experience), histories of past failures should be narrated to children. Furthermore pupils should be exposed to symbolic exposures such as creating environments which are similar to examination atmospheres because this will allow children to practice in dealing with stress. Techniques such as relaxation techniques should also be made available to pupils.

The Zambia Association of Mathematics Educators (ZAME) should educate its teachers and other stakeholders in mathematics to stop finger-pointing and running away from the problem of poor performance of pupils in mathematics. Instead, teachers and other stakeholders should aim at instilling positive mathematical self efficacy in their pupils. What should be born in their minds is that, pupils' self efficacy beliefs towards mathematics teaching and learning play an important role in national and individual development.

Curriculum Development Centre (CDC) should design a curriculum that has emphasis on the three domains namely, cognitive, psychomotor and affective. Currently, the mathematics curriculum puts less emphasis on the affective part of learning.
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APPENDIX A

Self efficacy questionnaire for pupils

Name ________________________________ Sex: ________

School ________________________________

Instructions

The items in this questionnaire are on appraisal inventory. Please read each item carefully and decide to what extent it applies to you.

Remember to respond to all items, even if you are not completely sure. Your answers will be kept in the strictest confidence. Also, please be honest in responding to these statements.

1. Doing your homework without help.
   A = yes    B = no    C = I do not know

2. Handing in your homework in time.
   A = yes    B = no    C = I do not know

3. Working in a group.
   A = yes    B = no    C = I do not know
4. Producing work that meet teachers’ expectations.
   A = yes  B = no  C = I do not know

5. Leaning a new card game or board game (e.g. chess, draft)
   A = yes  B = no  C = I do not know

6. Resisting pressure from friends to do things that could make you not to finish your homework.
   A = yes  B = no  C = I do not know

7. Discussing mathematical problems with a new classmate.
   A = yes  B = no  C = I do not know

8. Participating in lessons and class activities.
   A = yes  B = no  C = I do not know

9. Controlling your temper.
   A = yes  B = no  C = I do not know

    A = yes  B = no  C = I do not know
11. Completing exercises.
   A = yes  B = no  C = I do not know

12. Remembering how to do mathematical problems.
   A = yes  B = no  C = I do not know

13. Solving disconnected problems within a certain time.
   A = yes  B = no  C = I do not know

14. Building new skills on learned material.
   A = yes  B = no  C = I do not know

15. Keeping up or remembering all the steps learnt.
   A = yes  B = no  C = I do not know

   A = yes  B = no  C = I do not know

17. Remembering rules.
   A = yes  B = no  C = I do not know

18. Practicing what you have learnt.
   A = yes  B = no  C = I do not know
19. Observing children of other interests and abilities.

A = yes  B = no  C = I do not know

20. Interacting with children of other abilities and interests.

A = yes  B = no  C = I do not know

21. Learning from pupils with other abilities and interests.

A = yes  B = no  C = I do not know

22. Coping with teacher-made frequent comparative evaluation (e.g. you mean you cannot do this, I do not know why you are underperforming and yet am the same teacher)

A = yes  B = no  C = I do not know

23. Coping with an environment where you study the same material.

A = yes  B = no  C = I do not know
APPENDIX B

Name ____________________________  Sex: _____________

School _____________________________

Instructions

Attempt all the questions

1. Write the following numbers in standard form
   a) 20.961      b) 0.0851

2. Write the numbers in question 1 correct to
   a) the nearest whole number  b) three significant figures  c) two
   decimal places

3. If $x=5$ and $y=7$ to one significant figure, find the largest and smallest
   possible values of
   a) $x + y$      b) $y - x$      c) $\frac{x}{y}$

4. Find the values of
   a) $7^0$      b) $25^{-\frac{1}{2}}$      c) $(-27)^{\frac{1}{3}}$      d) $(-\frac{8}{27})^{\frac{2}{3}}$

5. R is inversely proportional to the square of S, if R=6 when S=4, find the
   value of R when $S=\frac{1}{2}$

6. Given that $y \propto \frac{1}{x}$ and that y=6 when x=5, find y when x=0.1

7. E={1,2,3,4,5,6,7,8,9}, A={1,2,3,4}, B={7,8,9} and C={1,3,5,7,9}. State
   the elements of $A'$, $A' \cap B$, $B' \cap C'$ and illustrate with Venn diagrams.
8. If \( n(A) = 10 \), \( n(B) = 7 \). What are the largest and smallest possible values of \( n(A \cup B) \) and \( n(A \cap B) \)?

9. It is given that \( E = \{a, b, c, d, e, f\} \), \( P = \{a, c, e\} \) and \( Q = \{b, c, d, e\} \)
   a) Find \( n(P \cap Q) \)    
   b) List members of \( (P \cup Q)' \)  
   c) List members of \( P' \cap Q \)

10. A dealer buys a number of articles for a total of $120. He sells all but one of them at a profit of $1.50 each for a total of $135. How many articles did he buy?
APPENDIX C

Focus group discussion for pupils

1. What do you understand by the phrase “I can do maths”?

2. Do you think there is a relationship between your belief that you can do maths and your good performance?
   i) yes  ii) no  iii) I do not know

3. If yes in 2, give reasons

4. If no in 2, give reasons

5. What things do you need to do to improve your performance?

6. What has driven you into liking maths?

7. How do you feel when you are about to write an exam?

8. Do you think your feelings really affect your performance?

9. How do you deal with what you have mentioned in 8 above?