

AN INVESTIGATION INTO THE CAUSES OF LOW PASS RATE IN MATHEMATICS AT DARWIN HIGH

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**AN INVESTIGATION INTO THE CAUSES OF LOW PASS RATE IN
MATHEMATICS AT ORDINARY LEVEL AT DARWIN HIGH SCHOOL**

BY

ALERT NDLOVU

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APPROVAL FORM

The undersigned certify that they have read and recommend to the Bindura University of Science Education of a dissertation entitled “An investigation into the causes of low pass rate in Mathematics at ordinary level at Darwin High school”, submitted by Ndlovu Alert in partial fulfillment of the Bachelor of Science Education Honours Degree Mathematics.

Ndlovu A -----

SUPERVISOR

--Hlupo P-----

PROGRAMME CO-ORDINATOR

EXTERNAL EXAMINOR

DATE _____

DECLARATION

I do hereby declare that this dissertation has been as a result of my own original efforts and investigations and such work has not been presented elsewhere for the purpose of degree assessment. Additional sources of information have been acknowledged by means of references.

Student

Supervisor

Ndlovu Alert-----

Hlupo P -----

Date-----

Date-----

Co-Supervisor

Date-----

DEDICATIONS

This research is dedicated to my husband, friend and mentor (Matoma Eliakem Cletus), my sons Derby Tendai, Tinotenda Golden and Mukudzeishe for their support during the long march.

ABSTRACT

The purpose of this study was to investigate factors contributing low pass rate in mathematics at ordinary level at Darwin High School in Mt Darwin District; Zimbabwe. The researcher was compelled by the recurrence of low pass rates in mathematics ordinary level for the past four years she has been teaching at Darwin High School. Pupils apparently perform fairly well at grade seven level but their performance at ordinary level is appalling. The researcher utilised the case study and historical research design for it was found useful in carrying out action based research. Data was collected through self administered questionnaires. Systematic sampling procedure was used to select a sample of 54 respondents, four mathematics teachers and fifty learners. The researcher used pie charts, tables and bar graphs during data presentation. The data was coded into meaningful themes for easy analysis. This current study was informed by Piaget's theory of cognitive development and Wiglan's productive environment experience theory. Factors ranging from those which are school based to those which are home based were found to be contributing to low pass rate in mathematics at ordinary level by pupils at Darwin High School in Mt Darwin District. Home based factors such as socio-economic background of parents, parents' attitude towards school work, and status of parents and school based factors such as the school environment, large classes, relationship between learners and the teacher were found to be contributing towards high low pass rate in Mathematics at ordinary level. The study recommends motivation of the teaching personnel so that best efforts can be exerted by the teachers, an effective personnel management system to be put in place to do away with erratic lesson observations, diversifying teaching methods (embracing ICT tools) to motivate learners and maintain the zeal to learn and to ensure there is reasonable teacher – pupil ratios to enable individual contact with teacher.

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CHAPTER 1 INTRODUCTION

1.0 Introduction

In Zimbabwe children are expected to go through academic education system which is comprised of Primary and secondary education. Under primary education, a child begins at early childhood development level A (ECDA) to grade seven level where he or she is expected to sit for a Zimbabwe school examination council (Zimsec) grade seven examinations. The grade examination results are used as entry grade qualification into Form one level under the secondary education tier. It is of much concern that there is a low pass rate in Mathematics at o level.

This research was aimed at investigating into the causes of low pass rate in Mathematics at ordinary level at Darwin high school in Mt Darwin district. Chapter one includes background of the study, statement of the problem, assumptions, research questions. Limitations and delimitations are going to be outlined in this chapter as well as definitions of key terms. Chapter two of the research deals with the review of related literature and chapter three is about research design and methodology while chapter four involves data presentation, discussion, analysis and interpretation and chapter five is the summary of the research, conclusions and recommendations.

1. 1 Background to the study

The researcher conducted lessons on directed numbers to form one pupils at Darwin high school. The lessons were thoroughly done and most pupils did their daily exercise well. It was surprising to find that upon administering a revision test, most pupils failed to score more than half of the total marks. The researcher re-taught the lesson using a totally different approach with the view of improving the conceptualization of the content. As the lessons were taught, pupils seem to be understanding everything but upon being given a revision test, they failed to tackle the questions. Pupils could add and subtract directed numbers using a number line but upon giving them a Table 1.1 to fill in, they failed.

Table 1.1 Directed numbers

+	1	2	3	4
-2			1	
-1				
0				
1				5

The researcher inquired from some mathematics teachers , teaching form two to form 4 as to find out if the problem of failing revision tests exists in their classes. It came to light that pupils fail tests despite showing understanding of concepts as they are taught in classes. This was proclaimed by most teachers who were asked.

The researcher went to find out about the mathematics pass rate at ‘O’ level in the previous year (2021 ZIMSEC mathematics examinations)

Again the researcher looked for the pass rate for the previous three years and below is a record of these pass rates.

Table 1.2 Zimsec Mathematics Results analysis for ‘O’ level from 2018 to 2020

Year	O level Mathematics pass rate
2018	25%
2019	22%
2020	22,18%

The researcher went on to compare the pass rates in mathematics and those in other subjects to establish performance trends .

Table 1.3 Zimsec Results analysis for ‘O’ level Mathematics, History , combined science and Shona

year	subject	Pass rate
2018	Mathematics	25%
	History	83%
	Combined science shona	67%
		74%
2019	Mathematics	22%
	History	81%
	Combined science shona	64 %
		68%
2020	Mathematics	22,18%
	History	76%
	Combined science shona	58,3%
		66,7%

As shown in Table 1.3 above, for the three consecutive years, mathematics pass rates are far below other subjects. This might be because pupils generally tend to fail tests in mathematics even though topics would have been taught at length .Some authors say researchers have revealed that pupils’ performance in Mathematics at “O” level in Zimbabwe secondary schools is poor (Nziramasa ,1999 ;Machingaidze ,Pfukani&Shumba ,1998) .Nziramasa (1999 ,p328) says ,”the people ‘s views on the Mathematics curriculum were strongest on ‘O’ level where high failure rate was seen as the biggest signal that Mathematics education was in crisis.” Machingaidze ,Pfukani&Shumba (1998) say , “pupils ‘ performance and pass rate in Mathematics at ‘O’level cause even greater

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concern .“ (p.6).The above results prompted the researcher to do an analysis of the grade seven results for form 1 yellow , form 1 green, form 2 yellow and form 2 green to find out the their general performance in grade seven and their form one mathematics entry grades. This is to determine the enrolment criterion at the school.

Table 1.4 Grade seven Zimsec results for form 1 yellow, form one green ,form two yellow and form 2 green.

Units range	6-12		13-18		19-29		30-36		37-54	
class	1yello w	1gree n	1yello w	1gree n	1yello w	1gree n	1yello w	1gree n	1yello w	1 gree n
Number of pupils	15	0	20	0	0	5	0	7	0	20
class	2yello w	2gree n	2yello w	2gree n	2yello w	2gree n	2yello w	2gree n	2yello w	2 gree n
Number of pupils	16	0	17	0	0	7	0	6	0	20

From Table 1.4 above 47 out of 67 pupils are in the range 6-36 units for form one and 46 out of 66 are in the range of 6-36 units in form two. However form one green represents the other four form one classes and two green represent the other six form two classes at the school not streamed .Only

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the yellow class is a streamed class at the school .The rest of the pupils are allocated classes randomly The enrolment is done randomly but 68.75% form ones passed their grade 7 ZIMSEC examination though 37.5 % passed with poor quality results . Therefore the results at ‘O’ level and even in the continuous assessment tools are expected to be good and must reflect that pupils enrolled at the school are capable.

Table 1.5 Mathematics entry grades for form one and form two

Units range	1-2		3-4		5-6		7-9	
class	1yellow	1green	1yellow	1green	1yellow	1green	1yellow	1green
Number of pupils	23	0	5	0	7	9	0	23
class	2yellow	2green	2yellow	2green	2yellow	2green	2yellow	2green
Number of pupils	15	0	9	2	9	8	20	6

The Table 1.5 above indicates that Mathematics pass rate at grade seven is 64% which is a remarkable pass. This implies that the pass rate at ordinary level in Mathematics should be good or even better considering that the pupils would have developed.

1.2 Statement of the problem

From the information gathered, there is a clear indication that Darwin High school has a low performance in Mathematics as compared to other subjects. This has prompted the researcher to investigate whether maximum effort in teaching and learning is exerted in the subject area by both teachers and learners. The desire is also to establish possible causes of the phenomenon and hence come up with possible solutions to curb the performance problem thereby improving the school's competency which is affected by a low pass rate in Mathematics.

1.3 Research objectives The researcher should be able to :

- i.To establish the causes of a low pass rate in Mathematics.
- iiTo come up with mitigation measures in how the pass rate in mathematics can be improved.

1.4 Research questions

The researcher should be able to answer the following questions:

- i. What are the causes of poor pass rate at ordinary when pupils are enrolled with good passes in Mathematics at secondary entry level?.
- ii. What are the measures which can be taken to improve pass rate in Mathematics at Darwin High school?

1.5 Limitations

Time was a limiting factor for the researcher to carry out an effective research since the research is carried out while the researcher is at work. Lack of financial resources was also a limiting factor to the researcher since most of information that the researcher used was found from the internet and sometimes the researcher failed to raise funds to buy data bundles.

1.6 Delimitations

The research was carried at Darwin High School which is situated in Mt Darwin District of Mashonaland Central Province in Zimbabwe. The study was delimited to a sample of form one to form four pupils at Darwin high school. This delimitation was due to the fact that a low pass rate

in Mathematics at the school is pronounced at school level and manifests in 'O' level results. The researcher therefore chose to deal with a sample of form one to form four pupils since these are pupils in the range of the 'O' level course. The investigation was focusing on factors that contribute to low pass rates in Mathematics yet form one entry grades are good, these factors may include, environmental experiences such as parental involvement, teaching and learning factors such as teacher qualifications and availability of materials in the subject area as well as attitudinal factors.

1.7.0 Significance of the study

The study aimed at spelling out the root causes contributing to poor performance in Mathematics. When root causes are identified, it is envisaged that the school authorities will be put in place measures to alleviate problems so as to improve performance of pupils in mathematics and create a better image of the subject at the school.

1.7.1 Significance to teachers

That will help teachers and facilitators with knowledge for teaching the subject to produce quality results and prepare the learners to be lifelong learners. Teachers may also identify gaps in their teaching methodologies and approaches and find ways to improve so as to achieve their objectives and ultimately the aims of their syllabi. Furthermore, the project may act as a source of motivation to teachers to further their studies so that they remain relevant in the teaching of the Mathematics.

1.7.2 Significance to parents

This project is going to help parents who have children learning at Darwin high school to involve themselves in the learning of their children. This could be through the provision of resources such as calculators, text books, smart phones for the children access the internet and also buying data bundles for their children. Parents can also develop interest on their children's work that is to find out whether their children are doing their homework and treating the subject with the level of seriousness it deserves. Parents expect their children to pass all subjects when they sit for public examinations. When that feat is achieved, parents are happy and satisfied.

1.7.3 Significance to learners

Recommendations made from this project help to correct negative attitude in students against mathematics and help them to consider mathematics as a subject of choice. When students are motivated to do mathematics, they would secure good results in their public examinations. As highlighted earlier on, establishment of problems causing low pass rate at school would help school staff to focus on solutions which would help to elevate mathematics pass rate at the school. When mathematics pass rate rises, the overall school pass rate rises as well giving the school a good reputation and image.

1.8 Assumptions

- i. Lack of motivation on the part of pupils to do mathematics is contributing to poor performance.
- ii. Lack of motivation of teachers due to poor remuneration and working conditions make them to put minimum or no effort to work
- iii. A negative attitude towards mathematics is contributing to the poor performance
- iv. Shortage of instructional material from both school and pupils is **causing** poor performance

1.9 Definitions of key terms

Grade - is defined by Magno and Ouano (2010) as a combination of several assessments that translate the result into some type of scale with evaluative meaning and reports the meaning in a formal way.

Academic performance.....the result of learning prompted by teaching activity by the teacher and produced by the student. Martinez (2007) postulates that it is the product given by the students and is usually expressed through grades.

Effective teaching and learning----- Bain (2004) defines effective teaching as a design by teachers to enforce better learning experiences for their students while Doyle (2008) claims that effective learning is the ability to use and apply information.

Gender-----Bell (2004) asserts that gender refers to the social attributes and opportunities associated with being male or female

1.10 Chapter summary

This chapter provided the research topics, the background to the study, the statement of the problem, assumptions, delimitations and limitations. The chapter also provide the significance of the study, the research objectives as well as the definition of key terms. The next chapter which is chapter two involves the review of related literature.

CHAPTER 2 REVIEW OF RELATED LITERATURE

2.0 Introduction

This chapter provides a theoretical framework of views of some authors and findings of some researchers on Mathematics achievement and the factors that contribute to poor pass rates in the Mathematics subject in general .It encompasses some factors that affect learning, how effective teaching and learning can take place and some practical challenges that can be faced in the implementation of skills and methods of teaching Mathematics. The researcher looked at factors that contribute to poor pass rate which include the child's cognitive development, environmental experience, teaching and learning factors and attitudinal factors. Some findings of this study as they relate to the literature will be anticipated in this chapter with details to follow in subsequent chapters. In the view of Hancock and Algozzine (2006) literature review is an account of what has been published on a topic by accredited scholars and researchers.

2.1 Importance of literature review

Literature review helps researchers glean the ideas of others interested in a particular research question of a similar nature as one under study. It is through literature review that researchers manage to come up with convincing arguments on why there is need to conduct a study on an identified problem .Furthermore, it is important to know whether a similar research has been previously carried out by other scholars so as to avoid duplication of work and efforts. Thus

through reference to available literature, the researcher can refine his or her statement of the problem.

2.2.0 Theoretical literature

2.2.1 Cognitive development theory

Mwamwenda (1995) defined cognitive development as an individual’s ability to organize information ,think and reason logically , understand concepts and solve problems .

Table 2.1 Piaget’s cognitive development theory

Stage	Age range	Behavior at this stage
Sensory motor	0-2 years	At this stage children learn through their senses and movement of body parts
Pre-operation	2-7 years	Children are able to present objects symbolically
Concrete operational	7-12 years	Children understand principles if activities are by backed up with concrete experiences (Beck ,2003)

Formal operational	12 +	Lefrancoise (1982) says that here children can make conclusions without concrete experience
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At the formal operational stage pupil can deal with abstraction, understand the form of the problem and have a longer attention paying span, Beck(2003) .This implies pupils in secondary school level should have reached at least the concrete operational stage to withstand the long periods of learning and even the long periods of practical subjects .

2.2.2 Theory of productivity- Environmental experience

The proponent of the theory of productivity is Walberg (1981) and the theory requires optimization of nine factors to increase student achievement of cognitive and affective outcomes. Amongst the nine factors, the home environment, classroom environment and peer group environment are mentioned. Wilkins et al (2002) classified the nine factors into three general groups and environmental variables related to the home , teacher , classroom , peers and media exposure were grouped together.

What pupils experience in their daily lives can enhance their conceptual skills during lessons. Borich and Tambori (1997) talks of expository organisers which direct learners to previous experience already in memory that is to be linked to new concept to be learnt. This then means that the environment from which a learner comes from has direct influence in their learning because technical tools that pupils are required to produce at school should be recognized by their organisers and be linked to already known tool from their environment. To this regard, Gilman and Anderson (2006) state that attitudes are learned throughout life and held in the way children are socialized at home and at school. Again the issue of environment involves the parental involvement in the pupil’s work which if not provided will lead to poor performance in their

academic work. Awe (2002) in Medinat (2007) postulates that learners of supportive parents tend to perform better at school than their counter parts whose parents are less involved, less supportive and who set expectations that are either too high or low. Parents' socio and economic background, parental attitude towards school work and the status of parents have impact on children's performance (Mukokeri, 2016).

The marital status as well as the parent's social status has impact on the learner's academic achievement. Adell (2002) articulates that a stigma is often attached to divorce and separation and this stigma has, in most cases transferred to the classroom. Parsons (2012) in his book Mathematics projects , states that Mathematics is the least understood academic subject and detested by many students .The same writer says Mathematics often draws the national attention, as it causes state and national academic records to decline if parents give little or no assistance to their children in the subject and pupils will not take it seriously that will result in low pass rates in the subject. To this regard, parents who give little or no assistance to their children in the Mathematics subject area lead to their children to not taking the subject seriously. Because of the limited support pupils will have low accountability.

In addition, the classroom environment plays a crucial role in the conceptualization of topics by leaners. How the teacher instructs the learners is of great importance. Hoover (1982) emphasizes that the teacher as an instructor carries out the classroom instructions to reach pupils using a variety of teaching methods and among them are demonstration, discovery learning, discussion, questioning.This then calls for a teacher to be competent enough to teach the subject matter. Most teachers do not use teaching and learning aids yet Kasanda (1997) found out that if no teaching and learning aids are used , teachers may not achieve excellence in their teaching of Mathematics. On the same note Petty (1993) says 87percent of information enters the brain through the eyes ,9 percent by the ear and 4 percent by other senses.

2.3.0 Empirical literature

2.3.1 Environment

In their research, Chikwature and Oyidele (2016) state that the average ordinary level pass rate in rural schools in Zimbabwe is 4.2 % and Luphahla (2012) articulates that most pupils who attend rural schools go there to prepare for failure, the same writer describes this as a painful reality. The same writers are of the view that environment plays a major role in the academic performance of pupils. In the same research Chikwature and Oyidele(2016) pointed out that in rural schools, school heads were mandated to allow all children without any form of discrimination to be given places to attend lessons hence classes where very large and mixed such that a pupil with 4 units attends the same class with one who obtained 36 units. This clearly suggests that the learning environment is not conducive and does not cater for special needs. Considering the research findings of Chikwature and Oyidele (2016) who state that in rural schools classes are very large, this suggests that teachers might find it difficult to fully exert their energy to each and every individual in the class and there may be pupils who are not attended to for a long period of time. In her study of performance Mukokeri (2016) in her study into the causes of high failure rate at advanced level Geography refers this scenario as a situation whereby a teacher hardly possesses an in-depth knowledge of the “lacks” and “wants’ of each pupil under his or her charge.

All in all the above information is suggesting the environmental factors such as parental support is a factor that also contribute to low pass rate in Mathematics.

2.3.2 Teaching and learning experiences

The issue of incompetent teachers has been mentioned in the analysis and comparisons done by UNICEF (2019) which blamed incompetent teachers who teach Mathematics and Science saying there is high rate of teachers who joined the teaching profession with the aim of just being employed but without the core values of the teaching profession and this has led to a number of schools in Zimbabwe and South Africa being full of teachers who do not value the academic achievement of the students. As such, such teachers do not care about the teaching methods they use as long as they are paid at the end of the month. Failure to employ effective methods when teaching topics that need fair attention from the pupils impact negatively on the attainment of

lesson objectives that will result in pupils failing to understand the taught concepts and at the end of four years fail to achieve good marks also.

Availability of instructional material is also a factor that contributes in the pass rate of pupils. The material ranges from the use of a variety of text books, sharing ratio of text books between pupils and teacher related factors such as the use of audio visual aids. Jaji (1990) carried a survey on 'o' level Mathematics teachers who use teaching and learning aids in their lessons and found that 16 percent always used them ,25 percent rarely or very rarely used them. Nziramasanga (1999) a commission set by the President of Zimbabwe to inquire into education and training, on the use of teaching and learning aids, found that at secondary school, few teachers bothered themselves with teaching and learning aids, the chalkboard was the most used Limb & Fullarton (2001), in their study made in the United States and in Australia on TIMSS (Trends in International Mathematics and Science Study) they found that students with more family cultural resources such as books at home and those from two parent families tend to have higher achievement levels in mathematics. The same research concluded that student from English speaking families have good performance in mathematics than non- English speaking families.

2.3.3 Attitudinal factors

In her study of performance, Mukokeri (2016) observed that parents' attitude toward school work has an impact on the performance of their children. The same researcher points that the attitude of parents toward a subject determine how high or low a pupil performs in that particular subject. The researcher concluded that members of the Johane Marange Apostolic sect whose religious beliefs place a little value on school work hardly inspire their offspring since their valued basic reading and writing. This pupils from families of this sect aspiring for higher academic levels tend to receive counter-progressive remarks from their dogmatic parents.

The study on factors leading to poor performance in mathematics made by Tshabala and Ncube (2013) revealed that the student's performance in mathematics was mainly affected by teaching

methods, material resources, teacher's behaviour grounding in the lower levels as well as their fear of the subject. The same researchers further concluded that variables such as attitudes toward mathematics, perceived importance of mathematics and time spent on mathematics homework were influential predictors of student's performance in mathematics.

2.4 Discussion

Theoretical and empirical literature reviewed are in strong agreement on the causes of low pass rate in mathematics. Walberg 's theory of productivity environmental experience and Piaget's cognitive development theory relates low pass rate in schools to environmental variables such as home, classroom, teacher, peers and media exposure. This was supported by empirical literature from studies done in other countries which also relates low pass rate in mathematics to shortage of instructional material, lack of parental support, negative attitude of teachers , parents and learners towards mathematics. However, the area has remained fertile for research in Zimbabwe as most studies carried pertaining the causes of low pass rate in mathematics were done in other countries. Therefore, it is yet to be seen whether the scenario in other countries presented by literature reviewed applies to Zimbabwe hence the need for the current study on the causes of low pass rate in mathematics at Darwin High School.

2.5 Chapter summary

This chapter reviewed literature related to the study. The chapter unfolded by reviewing the theoretical framework informing the study. Piaget's theory of cognitive development and Walberg's productive environmental theory was explored and related to the current study. This

was followed by an exploration of empirical literature on the causes of poor pass rate in mathematics at Darwin High School using a thematic approach.

CHAPTER 3 RESEARCH METHODOLOGY

3.0 Introduction

This chapter is outlining the procedures which were put in order to collect, present, analyse and interpret data .Thus the research design ,instrument and methods used to gather relevant information about the study are being spelt out. The researcher justified the selection of some data collection methods that were used in the study . Considerations were put on the demerits of the methods and ways of minimizing the negative effects of using such methods as employed in this study .

3.1 Research design

This is the overall plan of how the research was conducted. The researcher used a case study design as well as a historical design. The various responses given by participants helped the researcher to identify possible causes which are contributing to the low pass rate in Mathematics at the school as compared to other subjects .

3.2 Research instruments

The researcher employed observations and questionnaire methods of gathering data. The researcher used questionnaires for participants which were learners and Mathematics subject teachers relating to a low pass rate in the subject as compared to other subjects at the same school. The four Mathematics teachers expressed their views on the teaching and learning of Mathematics at the school on questionnaires.

Questionnaires explored attitudes, opinions and behaviors of the respondents towards the issue of causes of low pass rate in mathematics at Darwin high. Since a variety of people could attempt similar questions, the researcher was able to obtain a general overview of attitudes and experiences. Questionnaires were time saving as compared to other methods such as interviews. The other advantage of questionnaires lied in their secrecy in that respondents give their answers freely and information can be recorded and analysed. However, respondents could not get enough time and space to give much depth in their responses since short and precise answers were expected. Respondents could have wanted to explain themselves but questions were prescribed. There are high chances of getting misleading information, as the respondents sometimes could not easily understand the implications of the questions or if the respondents misinterpret the questions .

Two sets of questionnaires were designed , one for teachers (Appendix C) another for pupils (Appendix B) .The head of department was interviewed to express his views on the factors that contributed to low pass rates in Mathematics at Darwin high school and problems which they encounter in the teaching of Mathematics .

Conclusions and recommendations are to be drawn from the analysis of the gathered factual information using the central tendency approach .

3.3 The population of study

This is the entire set of members under investigation. Best and Kahn (1989) say that population refers to a group of individuals that have one or more characteristics in common that are of interest to the researcher. In this view a 800 pupils from form one up to form four form the population of study. The researcher chose to carry out the study on form ones to form four upon noticing that the problem of low pass rate is pronounced within this level at Darwin high school. The teachers were used as source of purposive data which was collected using questionnaires. Only the subject teachers were used to acquire facts about the subject under study .

3.4 The sample

Borg and Gall (1979) view sampling as selecting a number of people from a defined population for use as a representative set of that population. Smith(1975) supports the above definition by asserting that sampling is a procedure through which the researcher infers characteristics of some objects (the population) through experience with with all possible elements (the sample). It can therefore be concluded that a sample is a subset of a defined population on which measurement of variable is done. In this regard the sample for this study is made up of 50 members that is the mathematics students from Darwin high school and 4 Mathematics subject teachers. The researcher used Probability sampling particularly systematic sampling where after assigning values and determining the first unit randomly and adding n which in this case was 16 up to 800 which is N .

3.5 Reasons for sampling

Sampling was done to reduce subjects to a manageable group, this was meant to improve the quality of data captured. A small sample reduced the costs of collecting data as well as economizing time. This enabled the researcher to obtain the results of the study earlier. sampling

was also done to avoid individual bias as the researcher was not purposefully deciding the subjects to be studied except for the Mathematics subject teachers where purposive sampling was employed.

Although sampling has a good number of advantages, a sample can be unrepresentative depending on the sampling method to be used. Sampling created a rift between the researcher and the learners since some learners felt left out on issues that concern them.

3.6. Validity and reliability of instruments

To ensure maximum validity and reliability of the measuring instruments, the researcher clearly defined the traits or qualities she intended to measure. The researcher also created conditions that aimed at minimizing the effects of disadvantages of each measuring instrument. The validity and reliability of each question in questionnaires was relevant to the objectives of the study and to the research questions which were asked. Simple questions were designed so as not to confuse the respondents. Furthermore, the researcher explained to the subjects what was intended to be achieved and confidentiality was assured to the respondents. In addition, all questionnaires did not have names of the respondents and subjects felt free to express themselves.

3.7 Data Presentation and analysis procedure

Data analysis according to Cohen(2007) involves organizing, accounting for and making sense of the data in terms of the participants' definitions of the situation, noting patterns, themes and categories. Before data was categorized, the completeness and accuracy of questionnaires and interviews was checked. Proper scrutiny of those instruments was undertaken to get rid of mistakes, omissions and contradictions in responses. Data analysis is concerned about ordering and breaking down of data leading to statistical calculations being performed with the objective of finding answers to research questions. Data presentation principally is about how data is presented so that information is conveyed in a clear manner to the audience. The researcher used tables, bar

graphs and pie-charts in the presentation of data. The respondents' view points pertaining the causes of low pass rate in mathematics at Darwin high were coded into meaningful themes.

3.8 Chapter summary

The chapter outlined the research methodology used in this study. Research design employed, sample and sampling procedures used, the target population, research instruments used, data collection procedures, and the data analysis plan were discussed in this chapter. Questionnaires were the selected research instruments. Permission from school head was also sought. The next chapter is to dwell on data presentation, analysis and discussion.

CHAPTER FOUR 4 DATA PRESENTATION, ANALYSIS AND DISCUSSION.

4.0 Introduction

In this chapter the researcher presents data that was gathered pertaining the demographic information of the pupils and the subject teachers, availability of instructional material for use by both the teacher and the pupils, adequacy of time in doing Mathematics, parental support in doing Mathematics. This information is presented in tables, bar graphs and pie charts. The data is analysed and interpreted. The chapter is all about exposing the status quo through the presentation of the data and its interpretation.

4.1 Demographic information of pupils and teachers

Pertaining to the demographic information of the respondents (pupils and subject teachers) Table 4.1 below shows the statistical data from the respective respondents

Table 4.1 Demographic information of the respondents

Variable		Number of pupils	Number of teachers
AGE	12 -13 years	16	4
	14 -15 years	32	
	16-17 years	2	
	18 years and above	nil	
SEX	Males	23	4
	females	27	nil

With reference to Table 4.1 above all pupils are above 12 years, according to Berk (2003) they are almost psychologically developed to formal operation stage hence they can understand principles, the concepts, solving problems and a long concentration span. They are able to cope with long periods of learning for example in a 35- minute Mathematics lesson. In light of the above analysis, age of pupils seem not to be the problem for low pass rates in Mathematics at Darwin High School.

Out of the 50 participants, 46% are boys and 54% are girls which means the participation of girls in the research is slightly more than of boys. The Mathematics teachers at the school are all male teachers. From this, it is clearly shown that gender issues are really influencing girls as they may turn to think that Mathematics is a male oriented subject. This can be linked to what Botton (1994) says about gender and Mathematics. He blames societies which took the Mathematics subject to be suitable for male students and male students as having the ability to do the problem solving and carrying science experiments. In light of the above schools end up having a lot of just register for Mathematics examinations but without proper practice and preparation.

Again from the research the researcher gathered that the school is comprised of pupils who are mostly from farm and urban areas. 50% of pupils are from farms 48% of Pupils are from urban centres and just 2% are from rural areas. Pupils from farms might having a lot of household chores to attend to and may be lacking time to practice Mathematics at home. Having the same line of thought Hoover (1982) in his book, "learning Mathematics", states that lack of practice in Mathematics, neglecting the assignment and not putting the required effort in doing Mathematics is another reason why pupils perform badly in Mathematics.

It was noted with concern that most pupils who dwell in the urban centres are actually pupils from who rent at Mt Darwin locations for the purposes of going to school. These children are also expected to be given parental help in their academic work and if it lacks may also lead to poor performance in Mathematics as Zeicher and Liston (1996) suggest that lack of parental involvement can attribute to the pass rates that are very low in Mathematics. At home pupils will be loaded with a lot of work to do that will leave them with no energy to do school work or even practicing Mathematics.

With respect to the working experience of the Mathematics teachers, it is clear that all the teachers have a lot of experience as they all are above eleven years of experience in the field of teaching Mathematics. This is supported by Knoontz and Weihrich (1974) who posited that the process of thinking problem through making decisions and seeing a programme succeed rest in the experienced persons. However Parsons (1999) is of the view that no matter how a person may be experienced if he /she does not have adequate subject content he/she will remain incompetent. In this view Parsons is blaming incompetent teachers who may have a sounding number of years in the field but still being incompetent and without knowledge and wisdom as reason that can also contribute to the low pass rates.

All the Mathematics teachers at the school are qualified and three of them hold Bachelor of Education Degrees whilst only one teacher is a diploma holder. With this, it is clear that these people have studied the subject into detail and are well versed with the methods and strategies of driving the concepts home and therefore subject content is not an issue to the teachers. May be something important is lacking which Zeicher and Liston (1996) suggests as motivation. Students may suffer from low self-esteem and low expectations may prevent them from being in the subject and succeeding in their academic qualifications and especially in Mathematics.

4.2 Causes of low pass rates

Pertaining to the causes of low pass rates, data is presented on the responses of both the teachers and the students. The pie chart below shows the responses of pupils on parental involvement on their children's academic work.

4 .2.1 Lack of parental involvement

Question

Do your parents help you in doing your school work, be it home work or extra lessons? **Table**

4.2 Response of pupils on parental involvement

AN INVESTIGATION INTO THE CAUSES OF LOW PASS RATE IN MATHEMATICS AT DARWIN HIGH

Yes	No	Never
24	18	8

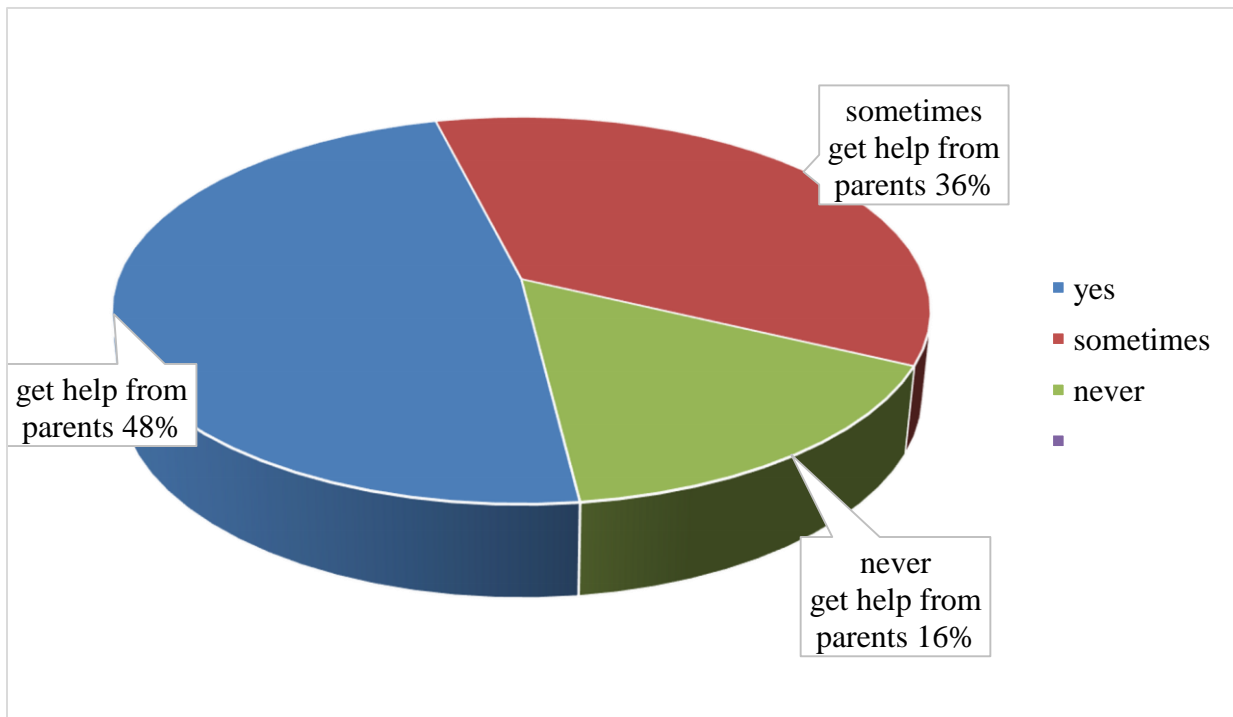


Figure 4.1 Lack of Parental Involvement

From the Table and the pie chart, 48% of the parents are giving help to their children at home 36% sometimes get help from their guardians and 16% never get parental attention from their parents as far as their school work is concerned. Although a good number of pupils find assistance from parents, it shows that the number which does not get assistance is quite significant and this is also a factor towards pupils' academic achievement. This is supported by the responses of pupils pertaining completion of homework 64% of pupils indicated that they completed their homework in time and 6% said sometimes completed their homework, and 24% never completed their homework mentioning lack of assistance, lack of resources and unavailability of time as the reasons

behind their failure to complete their homework in time. However, it can be said that the number of pupils who get parental help is outweighed by the pass rate which seems to be lower than expected if pupils are getting such assistance from their parents.

4.2.2 Shortage of instructional materials

Table 4.3 Respondents and responses concerning shortage of instructional material at the school.

Variable	Pupils' responses	Teachers' responses
Do you share text books	Yes....50 No.....0	
Sharing ratio	1:2.....0 1:3....0 1:4....0 1:5.....50	
How often do you use teacher made visual aids to explain Mathematical concepts		All the time.....0 More often.....1 Less often.....3 Never.....0

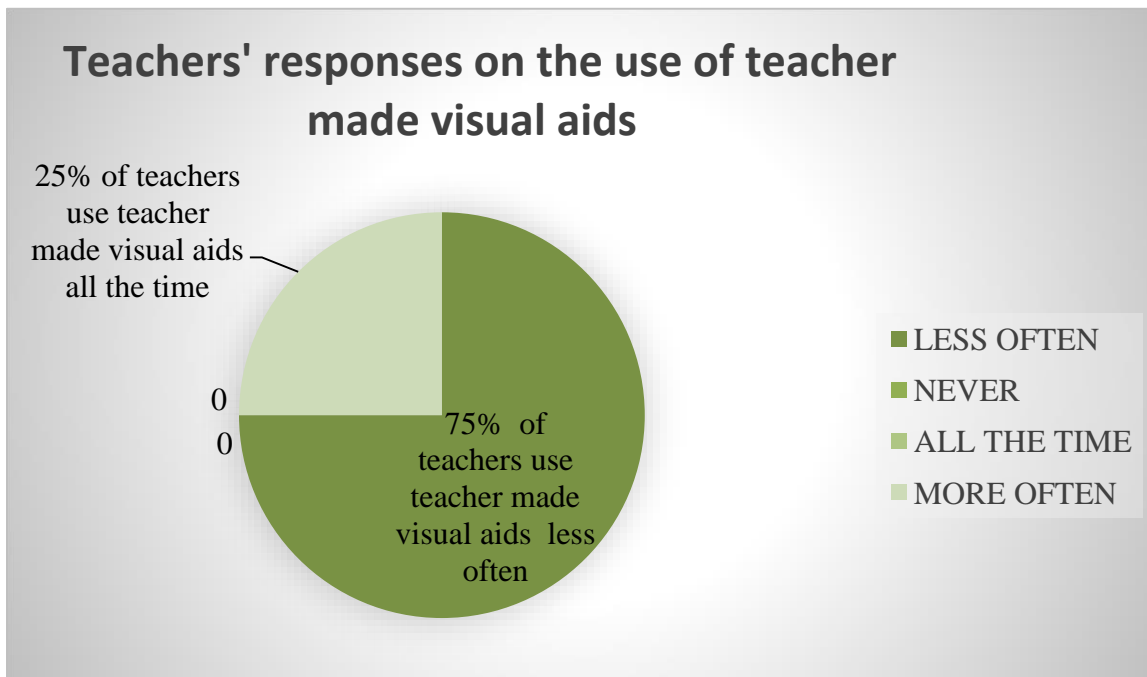


Figure 4.2 Use of teacher made visual aids to explain Mathematical concepts

From the pie chart and table above, there is a serious ignoring of the use of media of which pupils have different learning abilities and with this it shows that some of the pupils' needs are not met. One out of the four teachers said he uses teacher made visual aids more often and the other three teachers mentioned that they use teacher made visual aids less often. To this, Jaji (1990) said that Mathematics is very difficult to teach without manipulatives such as charts and models. Clark and Starr (1996) said that audio visual aids can assist to make ideas and concepts clear, and at the same time, learning from verbalism to true understanding is facilitated.

Jaji (1990) carried a survey on 'O' level teachers who use teaching and learning aids and found that 16% always used them, 25% rarely or very rarely used them. Nziramasanga (1999), on the use of teaching and learning aids found that at secondary school, few teachers bothered themselves with teaching and learning aids, the chalkboard is the most used. On this the commission suggested

that though the secondary Mathematic required sophisticated teaching and learning aids, the teacher could produce their own aids. The findings clearly imply that most teachers in secondary schools do not use teaching and learning aids in their lessons.

Again, on the use of teaching and learning aids in Mathematics lessons, Kasanda (1997) found out that if no teaching and learning aids are provided, teachers might not achieve excellence in their teaching of Mathematics. On the same not, the same writer says inappropriate use of the teaching and learning resources may hinder rather than enhance learning in the classroom. To this regard lack of the use of teaching and learning aids at the school might be one of the causes of low pass rate in Mathematics at Darwin high.

4.4 Attitudinal issues

The questions were meant to seek the attitude of the pupils towards the subject (Mathematics) and the Mathematics teachers. Hoover (1982) says if someone has a negative attitude towards something he/she will do nothing to improve or destroy it. It is a misconception that Mathematics is a difficult and challenging subject. Having this, it is therefore the teacher’s duty to motivate these pupils to like the subject by using various teaching strategies that meet the learning abilities of all the pupils and give examples that are not farfetched for the pupils to be able to link and appreciate the beauty of Mathematics.

Table 4.4 Responses on pupils’ attitude towards the teacher and the subject (Mathematics)

Variable	Pupils’ responses
Do you like doing Mathematics? Yes No Not sure	42 4 4
Do you like your Mathematics teacher?	

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Yes	42
No	8
Not sure	0

The above information is also presented on a bar chart in figure 4.3 below

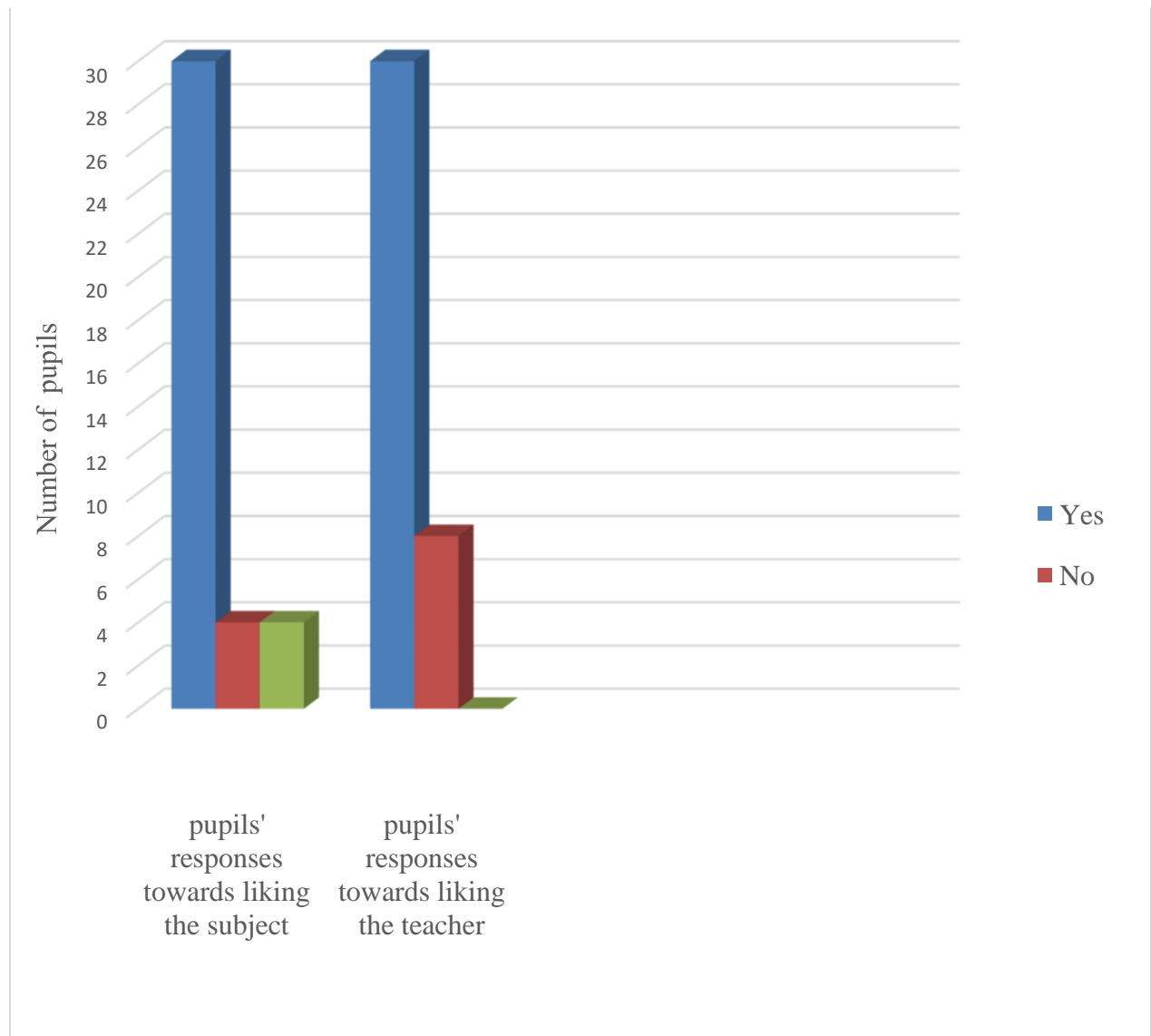


Figure 4.3 Pupils' attitude towards the subject and towards the teacher From the table and the chart presented above, it is clear that most pupils are interested in the subject and they do they like their subject teachers. Jaji (1990) focusing on approaches used by

Zimbabwean teachers at 'O' level has found that the major approaches used by Mathematics teachers were chalkboard (58%), use of practice books (20%), group discussions (8%), question and answer (4%), discovery through the environment (4%) and discovery through the textbook (2%). Basing on Jaji's findings, it is a clear indication that the methods that are mostly used are not learner centred and hence pupils are not motivated. Among the findings of the

Nziramasanga(1999), the ‘O’ level syllabus was found to be too academic, hence failing to meet the needs and interests of the majority of pupils. Nziramasanga (1999), further went on to say, “Mathematics teachers were of the view that the current ‘O’ level syllabus was not meant for and could not be done by every pupil(p.330). In line with this argument Jaji(1990), said that “while the syllabus intended curriculum, emphasise on discovery learning, problem solving and conceptual understanding, the majority of teachers emphasise mechanical processes” (p.1). This result in pupils being disinterested.

4.3 Measures to improve pass rate

Pupils were asked questions which sought to find out whether some of the measures to improve pass rate were being employed at the school such as supervision through lesson observation, resource mobilisation by the school and if extra work such as remedial and homework was given to pupils by the teachers.

Variable	Pupils’ responses
Does the members of the school administration sometimes observe Mathematics lessons?	

AN INVESTIGATION INTO THE CAUSES OF LOW PASS RATE IN MATHEMATICS AT DARWIN HIGH

Yes	3
No	47
How many times per term?	
Once	1
Twice	1
Not sure	1
Does the school buy Mathematics textbook every year?	
Yes	5
No	45
Do you sometimes have remedial lessons?	
Yes	11
No	39
Does your teacher require you to do homework?	
Yes	45
No	5

Table 4.5 Pupils' responses on questions pertaining measures to improve pass rate From Table 4.4 above, it is clear that lesson observations are not done at the school. Only 3 pupils agreed that lesson observations are being carried out. 47 pupils show that lesson observations are not done at the school. This is an indication that the school lacks supervision on the part of the teachers. Chivore (1994) said that poor performance of pupils at 'O' level, in Zimbabwe, is as a result of ineffectiveness of the teacher. To this regard there is the need for meaningful teacher supervision so as to improve the pass rate in Mathematics. On the other hand resource mobilization at the school is not all that pleasing. 45 out of 50 pupils said the school does not buy textbooks for pupils every year. This means that pupils and teachers end up using old textbooks which are in a tattered

state and even outdated. This may kill the pupils and the teachers' zeal to work hard. Both teachers and pupils need to use up to date and good textbooks. On the same note, it is clear that text books are inadequate, pupils are sharing textbooks at a ratio that is not encouraging hence attention should be given to this if the pass rate is to improve. Again, remedial lessons are a cause of concern. Only 11 pupils out 50 of pupils indicated that they were given remedy by the teachers. Special attention should be given to pupils who are less able hence remedial lessons are a necessity.

4.4 Chapter summary

The chapter was a presentation of data which was collected, its analysis, discussion and interpretation of the data. The data was grouped into categories such as the demographic information of teachers and pupils, parental involvement in the learning of pupils , availability of instructional materilas at the school, use of teacher made visual aids in the teaching and learning of Mathematics, attitudinal issues pertaining Mathematics acquisition of knowledgand measures to improve pass rate. Tables, pie charts and bar graphs were used to p.resent data. The next chapter is to present a summary of the research, conclusions and recommendations which are suggestions by the researcher pertaining the problem which was researched.

CHAPTER 5 SUMMARY, CONCLUSIONS AND RECOMMENDATIONS

5.0 Introduction

The research was aimed at establishing the underlying causes as to why there is a low pass rate in Mathematics at Darwin high school. Data was gathered, analysed, grouped and interpreted basing on the responses given by the participants who answered questionnaires and in some instances through observation since the researcher was a participant observer. Listed below are some of the major findings deduced from the research carried

5.2 Summary of findings

- i) The Mathematics teachers at Darwin high have the appropriate qualifications and experiences required for effective teaching and learning.

- ii) Again, it had been found that all the pupils at the school were of the right age and were as well above the recommended age for the forms as noted by Piaget, (1997) who asserts that children from 12 years and above use symbolic presentation. iii) There was a critical shortage of the essential instructional material in the Mathematics department. The sharing ratio is 1: 5 and this situation seriously worked against effective and efficient teaching and learning in Mathematics. iv) There was an attitude challenge in as far as both the teachers and the pupils were concerned. Generally, pupils perceive Mathematics as a difficult subject and most girls are comfortable of being out performed by boys in the subject hence they do not put maximum effort on the subject.
- v) There was lack of effective lesson supervision system by the school management vi) It has been noted that the school had a problem of big classes. Only 5 teachers were meant for Mathematics at a school with around 800 pupils all doing Mathematics.

5.3 Conclusions

The school is blessed with qualified teachers with vast experience in thr teaching and learning of mathematics

- i) The age of the learners is appropriate as Piaget (1997) asserts that children from 12 years and above use symbolic language, this means pupils are able to understand and comprehend mathematical language as well as withstanding longer lesson periods.
- ii) Unavailability of instructional materials could be a major cause of demotivation of learners and probably even the teachers.
- iii) A noticeable negative attitude towards the subject a swell as the teacher was evident from learners. iv) The school management employed a laissez faire leadership style where supervision is minimum
- v) Teacher pupil ratio was too big, some pupils could be hardly attended to by the teacher.

5.4 Recommendations

- i) The researcher encourages the school management device mechanism to motivate the staff, so that the teachers could put their best efforts in the teaching and learning of Mathematics.
- ii) There is really a need for the school management and the concerned teachers to sincerely and seriously engage each other to come up with a lasting solution.
- iii) An effective Personnel management system should be put in place, so as to help in solving the issue of ineffective and erratic lesson observation.
- iv) To improve the attitude of the pupils the teachers ought to improve in a number of ways, which include diversifying the teaching methods and strategies. Ensure that various aids and teaching media are used so as to promote and maintain the zeal to learn by the students.
- v) Effective teaching and learning tend to occur when there is an acceptable teacherpupil ratio. As such the school is encouraged to devise a strategy that would result in a teacher –pupil ratio which would promote an effective teacher- pupils interaction. One of the options available would be to accordingly reduce enrollment in all the future intakes or request for more mathematics subject teachers from the district offices or even to liase with teachers’ colleges so that the school can access teachers on teaching practice who can help reduce the loads.

5.4 Chapter summary

Teaching and learning are processes which call for a collaborative approach by the various stake holders, especially critical and instrumental is the existence of a mutual relationship between the teachers and the school administration. Providing adequate resources to the teachers would go a long way in improving the teaching and learning circumstances. This study had indeed managed to expose some of the problems that could be as well affecting our

education system. This chapter carried the conclusions which are the major findings and the recommendations made by the researcher which are suggestions to improve pass rate at Darwin high.

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APPENDIX A

Darwin high school

Box 35

Mt Darwin

To whom it may concern

Dear Sir/ madam

RE: APPLICATION FOR PERMISSION TO CONDUCT A RESEARCH AT YOUR SCHOOL

I hereby write this letter to seek permission to conduct an educational research at your school. The research is about to make an investigation into the reasons for low pass rates in Mathematics and is a requirement for the fulfillment of the study towards an HBSC Ed degree in Mathematics

I hope my request will receive your favorable response.

Yours faithfully

Ndlovu Alert

APPENDIX B

Questionnaire for pupils

Darwin high school

Box 35

Mt Darwin

Dear pupil

You are kindly asked to answer this questionnaire with utmost faith. The purpose of asking these questions below is to come up with the reasons why the pass rate in Mathematics at 'O' level is low at Darwin high school as compared to other subjects. Information gathered from you shall remain confidential (secret to all Darwin high school staff members) but help to come up with solutions to the above mentioned problem. The solutions will help you and other generations to come and your maximum co-operation will be greatly appreciated.

Thank you

\

INSTRUCTION

Tick the box with the correct answer and where the answers are not provided ,fill the space provided with your own answer.

SECTION A : DEMOGRAPHIC INFORMATION

A₁ : Age of respondent

12-13 years	
14-15 years	
16-17years	
18 and above	

A₂ : Sex

Male	
female	

AN INVESTIGATION INTO THE CAUSES OF LOW PASS RATE IN MATHEMATICS AT DARWIN HIGH

A₃ : Place of origin

Mine	
Farm	
Rural	
Urban	

A₄ : Status of parents

Both alive	
One alive	
Both deceased	
Divorced	

SECTION B : Causes of low pass rate

B₁ : Do your parents help you doing your school work be it homework or extra lessons?

yes	Sometimes	never

B₂ : Do you always complete your Mathematics home work in time?

Yes

No

Sometimes

--	--	--

B₃ : (If no) what are the factors which contribute to your failure to do your homework?

AN INVESTIGATION INTO THE CAUSES OF LOW PASS RATE IN MATHEMATICS AT DARWIN HIGH

(i)Lack of resources

--

(ii)Lack of assistance

--

(iii)Unavailability of time

--

(iv)Unable to solve the problems

--

(v)None of the above

--

B₄ : Do you like doing Mathematics?

Yes

No

Not sure

--	--	--

B₅ : Do you like your Mathematics teacher?

Yes

no

--	--

AN INVESTIGATION INTO THE CAUSES OF LOW PASS RATE IN MATHEMATICS AT DARWIN HIGH

B₆: Does the teacher attend all Mathematics lessons?

Yes

no

--	--

B₇: Do you share textbooks?

Yes

no

--	--

B₈: (If yes) What is the sharing ratio?

1: 2	
1: 3	
1: 4	
1: 5	

SECTION C : Measures to improve the pass rate

C₁: Does the members of the school administration sometimes observe your Mathematics lessons?

Yes

no

AN INVESTIGATION INTO THE CAUSES OF LOW PASS RATE IN MATHEMATICS AT DARWIN HIGH

--	--

C₂: (If yes) How many times per term?

Once	
Twice	
Not sure	

C₃: Does the school buy Mathematics text books every year?

Yes

no

--	--

C₄: Do you sometimes have remedial lessons?

Yes

no

--	--

C₅: Does your teacher give you homework?

Yes

no

--	--

APPENDIX C

Questionnaire for teachers

Darwin high school

Box 35

Mt Darwin

Dear sir /madam

I am hereby kindly asking you to fill answers to the questions on this questionnaire. I am conducting an research as per the HBscd in Mathematics degree requirement. Information obtained here shall remain confidential and may be used to improve pupil's performance in Mathematics.

Your co-operation will be greatly appreciated

QUESTIONNAIRE FOR TEACHERS

Tick the box with the correct answer and where the answers are not provided fill the space provided with your own answers .

SECTION A : DEMOGRAPHIC INFORMATION

A₁ : Professional qualifications

Diploma	B .Ed	M .Ed	Other

A₂ : Working experience in years

1-5	6-10	11-15	20+

A₃: What is the demographic pattern of pupils who are enrolled here in terms of their place of residence

AN INVESTIGATION INTO THE CAUSES OF LOW PASS RATE IN MATHEMATICS AT DARWIN HIGH

Rural	Urban

SECTION B: CAUSES OF LOW PASS RATE

B₁: Do most pupils whom you teach show interest in Mathematics?

yes	no

B₂: Are there adequate books for the teaching of Mathematics ?

Yes	No

B₃: What is the sharing ratio

?.....

Tick the appropriate box

AN INVESTIGATION INTO THE CAUSES OF LOW PASS RATE IN MATHEMATICS AT DARWIN HIGH

B₄ :Use of instructional materials

	All the time	More often	Less often	Never
How often do you use teacher made visual aids to explain Mathematical concepts ?				
How often do you give pupils the chance to demonstrate on the white board?				
How often do you consult other books apart from the New General Mathematics ?				

B₅ : Is the time allocated for Mathematics enough ?

Yes	No

AN INVESTIGATION INTO THE CAUSES OF LOW PASS RATE IN MATHEMATICS AT DARWIN HIGH

B₆ : How do you rate your Mathematics pupils ?.....average.....below average.....
above average.....

