

## **An Investigation into the Nature and Extent of Poor Performance of Girls in Mathematics in Chimanimani District in Zimbabwe's Manicaland Province**

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**Abstract:** The aim of this study was to investigate the nature and extent of poor performance of girls in mathematics in Chimanimani District in Zimbabwe's Manicaland Province. The population comprised all the teachers and pupils in the districts' secondary schools. The sample was made up of 50 forms one to four female pupils and thirty (30) teachers. The study employed the quantitative methodology and adopted the descriptive survey design. All the information was collected through a questionnaire. The study revealed that students performed badly in mathematics particularly in geometry and trigonometry. A multiplicity of variables were responsible for the poor performance of girls in mathematics, these include phobia for mathematics, shortage of textbooks, poor methods of lesson delivery and large class sizes. The study recommends that more attention be paid to recruiting of teachers with proper qualifications to guide pupils on mathematics. Mathematics should be made a compulsory for all girls in secondary schools. Parental involvement, regular assessments tests, refresher courses and workshops for teachers' provision of adequate resources and career counseling of the girls should be prioritized in the schools.

**Keywords:** Nature, extent, poor performance, mathematics, district

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### **INTRODUCTION**

The performance of girls in mathematics in Zimbabwean secondary schools has been consistently poor over the years [1]. More boys than girls tend to opt for mathematics in schools and their performance in this subject tends to be better than that of girls as well [2]. After completion of their schooling, more boys than girls tend to pursue careers in the field of mathematics [3]. Sometimes, the arguments about hormones are put forward as the reason why girls do not perform well in subjects like mathematics and science [4]. As Gumbo [5] argues, when girls opt for mathematics streams, the figures show that they perform well and that many girls are guided wrongly by teachers towards a literary stream after a purely mechanical judgement of their aptitudes. It does seem that girls have a less clear vision of what the goal of their studies should be [6]. They claim more often than boys to have chosen the direction of their studies according to their personal preferences and not on the grounds of their professional future [4]. They show themselves to be less certain of themselves when they are confronted with mathematics and where they are of equal ability with boys in a class, a girl will hesitate before choosing to follow a mathematics stream [2]. At school, most boys have been found to prefer to work without girls, because they do not think the girls are prepared to put forth enough

effort, particularly in mathematics, a subject where plenty of concentration and steady willingness to work is regarded as essential [7]. Mathematics is a very crucial subject in the Zimbabwean context because as [5] observes, all prospective government employees are expected to have passed at least five subjects at Ordinary Level including mathematics, and currently, the government is the largest employer [3]. It is against this background that this study set out to investigate the extent and nature of poor performance of girls in mathematics in Zimbabwean secondary schools.

### **Statement of the problem**

The performance of girls in mathematics in most secondary schools in Zimbabwe is generally very low if compared to that by boys. In most schools, more boys than girls register for mathematics at public examinations. There is need to investigate this problem in order to motivate girls to take up the subject as it is very critical for their future.

### **Purpose of the study**

The main purpose of the study was to investigate the nature and extent of poor performance of girls in mathematics in secondary schools.

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## Research questions

The study was guided by the following sub-questions:

- What are secondary school girls' attitudes towards mathematics?
- Which is the most difficult branch of mathematics for girls?
- Are there adequate resources for the effective teaching/learning of mathematics in the secondary schools?
- Is mathematics receiving adequate supervision from heads of schools and heads of departments?

## Limitations of the study

The major limitation relates to the descriptive method that was employed in this study. As Kumar [8] observes, the descriptive model lacks "predictive power", the research may discover and describe "what is" but is unable to predict "what would be". The respondents may also give false responses thereby affecting the validity of the findings [9]. This was mitigated by triangulation within the method.

## Delimitation of the study

The study delimited itself to the investigation of the nature and extent of poor performance of girls in mathematics in Chimanimani secondary schools using a sample of 500 girls and 30 teachers teaching mathematics. Heads of schools, heads of departments, inspectors and parents were outside the purview of this study.

## REVIEW OF LITERATURE

Poor examination performance in mathematics limits girls' opportunities to pursue higher education because students' academic performance and career choices at the primary and secondary level have lifetime ramifications in terms of employment opportunities [10]. Performance at public examinations at secondary schools determines the likelihood of attending universities and other tertiary institutions [11]. According to Musser and Burger [12], mathematics has quite a history which can be traced back to when every culture on earth had its own mathematics and the mathematics of the different cultures developed to become what is now mathematics. As Dube [4] posits, mathematics as a subject done at high school level involves lively thinking, communicating, problem solving and logical reasoning. Mathematics has four branches, namely arithmetic, algebra, geometry and trigonometry [6].

Algebra is the study of the formal manipulations of equations involving symbols and numbers and solving practical problems by using symbols using letters for unknown quantities [13]. Geometry deals with the size, shape such as are to be found in nature, and in the designs of art and

architecture, and trigonometry involves the study of triangles and the trigonometric functions [7].

The poor performance in mathematics by girls at secondary school level has also been attributed to what Gibson [7] terms the self-fulfilling prophecy. According to Gibson [7], the self-fulfilling prophecy is the result that occurs because it is expected or foretold. In other words, if a pupil acts in the way the teacher expects him/her, the teacher's prophecy would have been fulfilled hence the self-fulfilling prophecy [7]. Phye [6] attributes girls' poor performance in mathematics in secondary schools to this self-fulfilling prophecy. This is because of the mythical belief that girls cannot do well in mathematics [14]. As a result, boys get more than just adequate encouragement to do subjects like maths and science while girls get little encouragement [3]. Girls no matter how capable or willing they are have little or no encouragement from teachers and the result is that girls perform poorly in mathematics [3].

The phenomenon of secondary school girls performing poorly in mathematics is not unique to Zimbabwe. According to Dale [15] studies in the United Kingdom revealed that girls did poorly in mathematics because of a negative attitude towards the subject. The study also established that girls in co-educational schools performed slightly better than girls in girls' only schools. The reason for this was found to be that girls in co-educational schools had a more positive attitude towards the subject because they benefitted from friendly rivalry with the opposite sex [15]. In the United States of America as Clarkson [16] states, the multiple choice standardized tests in mathematics tended to be biased in favour of males and communication skills in mathematics may not eliminate the bias.

Attributing learner failure in mathematics to lack of skill has been alluded to by Du Perez [17] who posited that learners could not do well in mathematics when their teachers who were supposed to guide them did not know the subject themselves. The situation of being unqualified in mathematics was worsened by the revelation that there was a critical shortage of mathematics teachers in schools [18]. The students thus believed that they failed the subject because there was no one to teach them. Attributing poor learner performance to teachers' use of poor teaching methods confirm findings by Nyaumwe *et al.* [19] who reported that some of the methods teachers use do not help students develop conceptual understanding of mathematics hence the high failure rate in the subject in Zimbabwe. Agyeman [20] also state that teachers who are professionally under-qualified in mathematics would have a negative influence on the teaching and learning of the subject and this negative influence will

contribute to the high failure rate of mathematics in examinations.

According to Tachie and Chireshe [18] the other external factor that students attributed to their failure of the subject was lack of material resources. There were not enough relevant textbooks for mathematics. Another factor related to lack of material resources was shortage of classroom space. As Zacharia and Barton (2004) cited in [18] argue, students revealed that they could not perform well in mathematics because the classes were revelation is that the overcrowding disturbed the learning of pupils.

Students also attributed their failure to teacher behavior such as absenteeism, insulting and not motivating learners [18]. Some teachers were alleged to come to school drunk and did not concentrate on teaching the subject. The finding attributing learner failure to teacher behavior confirms that of Kolenski [21] who argued that a student may develop a strong dislike for a certain subject whose teacher habitually ridicules him/her in front of his / her peers. Avital [22] states that in some instances, students also mentioned that some of the teachers did not understand all the chapters in mathematics textbooks, and so it was difficult for them to assist students on those areas as they did not understand them and when students raised the issue the teachers became angry and even violent.

Fullan [23] is of the opinion that the head's support is another critical variable that determines the performance of pupils in a particular subject. As McLaughlin [24] opines, the head's support is the raw energy of implementation and it comes in various forms like information, individual skills, relationships, group myths and values or fiscal support, communication, training, monitoring and evaluation. Hard [25] observes that the head is a key figure and sees him/her as needing to have an understanding and knowledge of curriculum development in order to make appropriate choices and also to be sensitive to the tensions that inevitably arise in the process of teaching so that he / she provides teachers with support without dominance.

## METHODOLOGY

The study employed the quantitative methodology and made use of a survey research design.

**Table-3: Responses to the statement: "Most girls strongly believe that mathematics is a difficult subject" (N=530)**

Category of responses	Teachers		Pupils		Totals	
	Frequency	%	Frequency	%	Frequency	%
Yes	27	90	422	84	449	85
No	3	10	68	14	71	13
Not sure	0	0	10	2	10	2
Total	30	100	500	100	530	100

According to Cohen and Manion [26], the descriptive survey design looks with intense accuracy at the phenomenon of the moment and then describes precisely what the researcher sees. The questionnaire was used as the instrument for collecting data. Random sampling was used to come with sample of 500 pupils and 30 teachers. The researchers distributed the questionnaires through the Zimbabwe Teachers' Association structures and collected them after one month. Heads of schools were informed well in advance about the research and they granted permission to the researchers. Data gathered through the questionnaire produced descriptive statistics around the variables under study and these statistics were computed and inferential implications from them derived and recorded.

## FINDINGS AND DISCUSSION

The study set out to establish the nature and extent of poor performance of girls in mathematics in Zimbabwean secondary schools.

### Presentation of Data

**Table-1: Composition of students by form (N=500)**

Form	Frequency	Percentage
1	98	20
2	142	28
3	160	32
4	100	20
Total	500	100

Table 1 above shows that 32% of the respondents (girls) were doing Form 3, 28% doing Form 2 and 20% each for Form 1 and Form 4. All the classes from Form 1 to Form 4 were fairly represented.

**Table-2: Composition of teachers by gender (N=30)**

Sex	Frequency	Percentage
Male	25	87
Female	5	17
Total	30	100

The information above reveals that there were more male teachers (83%) teaching mathematics than female teachers (17%) teaching the same subject.

Both teachers and girls indicated that there was strong belief by most girls that mathematics was a difficult subject (teachers: 90% and girls: 84%

respectively). Only a paltry 13% average from both teachers and pupils thought otherwise.

**Table-4: Responses to the question: Which branch of mathematics do you find most difficult? (N=530).**

Branch of mathematics	Teachers		Pupils		Totals	
	Frequency	%	Frequency	%	Frequency	%
Algebra	2	5	15	3	17	3
Arithmetic	2	8	35	7	37	7
Trigonometry	16	52	305	61	321	61
Geometry	10	35	145	29	155	29
Total	30	100	500	100	530	100

From table 4 above, it is apparent that trigonometry and geometry were viewed as most difficult branches of mathematics by both set of

respondents (teachers: 52% trigonometry and 35% geometry; pupils: 61% trigonometry and 29% geometry respectively).

**Table-5: Responses to the question: "Do your schools have adequately resources/equipment?" Indicate which materials are lacking (N=530)**

Equipment / Material	Teachers		Pupils		Totals	
	Frequency	%	Frequency	%	Frequency	%
Textbooks	2	5	0	0	2	1
Graph books	20	66	360	72	380	72
Mathematical sets	8	29	140	28	148	27
Total	30	100	500	100	530	100

Table 5 shows that most respondents indicated that their schools had enough mathematics textbooks but lacked graph books and mathematical sets. Those who indicated that graph books were lacking constituted

72% and those who indicated that mathematical sets were a problem constituted 27% of the respondents. Only 1% of the respondents stated that textbooks were a problem.

**Table-6: Responses to the question: "At what times do you prefer to do mathematics?" (N=530)**

Preferred time	Teachers		Pupils		Totals	
	Frequency	%	Frequency	%	Frequency	%
Morning	20	66	480	96	500	94
Afternoon	8	28	15	3	23	4
Anytime	2	6	5	1	7	2
Total	30	100	500	100	530	100

Table 6 above shows that both teachers and pupils preferred to do mathematics in the mornings (94%). However, a sizeable number of teachers (28%)

indicated that could teach the subject in the afternoons or anytime (6%). Of the pupils' respondents 96% wanted to do mathematics in the morning.

**Table-7: Responses to the question: "Does the head of school or head of department frequently supervise teaching and learning of mathematics? (N=530)**

Category of responses	Teachers		Pupils		Totals	
	Frequency	%	Frequency	%	Frequency	%
Yes	5	18	25	5	30	6
No	25	82	475	95	500	94
Total	30	100	500	100	530	100

According to information on table 7 above, heads and heads of departments were not prioritizing the supervision of mathematics teaching and learning.

## DISCUSSION

Most teachers teaching mathematics in secondary schools in Chimanmani District are male; and very few female teachers are teaching the subject as

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shown by evidence from this study. This corroborates findings and observations by Gibson [7] who postulates that, historically more males than females have enrolled in STEM (Science, technology, engineering, mathematics) programs at university and colleges than females and this then leads to more mathematics teachers being male, simple because there were more male than female university and college graduates.

Evidence from the study also reveals that both teachers and pupils believe that girls fear mathematics as a school subject and this has led to negative attitudes towards the subject. As Dale [15] argues, because mathematics anxiety can cause mathematics avoidance, an empirical dilemma arises. For instance, when a highly mathematics anxious student performs disappointingly on a mathematics question, it could be due to mathematics question, it could be due to mathematics anxiety, or the lack of competency in mathematics because of mathematics avoidance. On mathematics and gender, Dube [4] states that research has shown that children at approximately nine years of age do not show consistent gender difference in relation to mathematics skills. However, in 17 out of 20 countries examined, 13 year old boys tended to score higher than girls. Moreover as Dube [4] argues, mathematics is often labeled as a masculine ability; as a result, girls often have low confidence in their mathematics capabilities.

The two branches of mathematics that gave pupils serious challenges are geometry and trigonometry. Both teachers and pupils concurred that these two branches were the most difficult for pupils. Particularly girls; and yet these are very important components of mathematics. As Du Perez [17] state trigonometry is the branch of mathematics concerned with the properties of trigonometric functions and their application to the determination of the angles and sides of triangles used in surveying and navigation among other important areas. On the other hand geometry is concerned with the properties of space and figures.

Most schools in the study had adequate textbooks for mathematics. However, materials like graph books and mathematical sets were not available in most of the schools; and yet these are very crucial for effective teaching and learning of the subject. These tallies with findings by Tachie and Chireshe [18] who state that students revealed that they could perform well in mathematics because they lacked basic materials like exercise books and instruments to do the subject.

Most pupils and teachers preferred to do mathematics lessons during morning sessions than during afternoons. The implications of this finding are that mathematics concepts are better understood in the morning than in the afternoon. Phye [6] states that students preferred morning time more than afternoon

time and cited fatigue as the major reason that made it difficult for them to understand concepts in mathematics during the afternoon sessions. However, research has shown that it is unclear if student attention is consistently affected by time of day influences [15]. This is because of the fact that there seems to be many confounding influences (such as the classroom ecology factors) when looking at attention [15].

Heads and head of departments (HODs) were not providing adequate supervision and guidance to teachers and pupils doing mathematics in the schools. For example, Fullan [23] is of the opinion that the head's support is another critical variable that determines the performance of pupils in a particular subject. The head's support is the raw energy of implementation of a curriculum and it comes in various forms like information, individual skills, relationships and values or fiscal support, communication, training, monitoring and evaluation [24].

## CONCLUSIONS

In the light of the preceding findings, the following conclusions suffice:

- Most teachers teaching mathematics in Chimanmani District are males with females constituting a very insignificant number.
- Girls in secondary schools have a very negative attitude towards mathematics.
- Trigonometry and geometry are the most difficult branches of mathematics for most pupils.
- The most preferred time for doing mathematics is the morning session by both teachers and pupils.
- Heads of schools and heads of departments (HODs) were not providing adequate supervision and guidance to teachers and pupils on the subject.

## Recommendations

In view of the foregoing findings and conclusions, the research puts forth the following recommendations.

- There is need to encourage more women teachers to do mathematics at teacher training colleges and universities so that they can be deployed in the schools for them to be role models for the girls to be motivated to do mathematics.
- A positive attitude to mathematics should be developed among female students to help demystify the myth that mathematics is a difficult subject.
- Teachers should be guided by heads and heads of departments so that they vary their teaching methods to avoid scaring students.
- Schools should provide adequate learning and teaching material like mathematical sets, and



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graph books in order to enhance effective learning and teaching of the subject.

- Teachers should be staff developed on all key aspects or branches of mathematics especially trigonometry and geometry in order for them to be able to simplify concepts in these areas for pupils.
- Heads and heads of departments (HODs) should supervise the teaching of mathematics. There should be more lesson observations on this subject and more experienced teachers should demonstrate for the less experienced on how best to teach concepts in this subject.

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