

Original Research Article

A Critical Analysis of the Factors Affecting Achievement in Secondary School Mathematics in Zimbabwe: A Case Study of Gweru District

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Abstract

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The issue of poor achievement in secondary school mathematics has been a subject of debate in Zimbabwe. People have attempted to argue and explain without making a critical analysis of possible factors. In Zimbabwe and possibly the world over, Mathematics is viewed as an essential tool for solving everyday problems, for example: gateway to employment, attainment of further studies, vehicle for critical thinking, and also as a language of communication. Despite its usefulness, importance and high esteem, many people consider or find it to be difficult to comprehend. Statistics show that many students fail and drop mathematics in their course of study. Research has shown that high mathematics perceptual anxiety over and negative attitude to mathematics are common among most students and even among some of the teachers. This study sought to examine the factors affecting achievement in Ordinary Level Mathematics in secondary schools in Zimbabwe. The research used a mixed-methods approach. Thus data were generated and collected from 6 secondary schools. A sample of 36 students, 12 teachers, 8 parents of 'O' level students, 10 employers, and a Mathematics education officer was chosen using stratified sampling techniques. Structured questionnaires, open ended questionnaires, interviews and focus group discussions were used to gather both qualitative and quantitative data. Information was analysed quantitatively and qualitatively. It was found that the factors could be grouped into different categories such as curriculum or syllabus related resources or school based causes, teacher competency, socio-economic forces, examination systems and student perceptions. The study recommended a systematic revision of the Mathematics curriculum.

Keywords: Mixed methods, mathephobia, ordinary level, pragmatist paradigm

INTRODUCTION

From the researchers' own observations and experiences as secondary school mathematics teachers and as teacher educators, the problems of high failure rate in "O" level mathematics in the Gweru District secondary schools have been consistent. Research has shown that high mathematics anxiety and negative attitude to mathematics are rampant among most students and

even among some of the teachers (Chirume, 2012). Statistics also show that many students fail and drop mathematics. The statistics for the entire Midlands Province in 2009, shown in Table 1, serves a clear testimony for this scenario. The situation has not been any better in the previous years: (see also Table 2).

One could ask why we are focusing more on math-

Table 1. Mathematics Dropout and Pass Rates (%) in the Midlands Province: 2009

'O' Level	Dropout Rate	Pass Rate
Male	72.1	27.4
Female	70.0	14.8
Overall	71.0	20.9

Note: From Education Officer, Planning, 2010, Ministry of Education, Midlands Province

Table 2. Percentage Pass Rates for all Subjects in the Midlands Province

Year	Grade 7	'O' Level	'A' Level
2003	36.0	24.4	86.2
2004	36.2	15.7	68.5
2005	44.0	19.1	77.6
2006	45.4	24.4	82.3
2007	56.7	19.2	81.5
2008	40.4	17.0	67.5

Note: Education Officer: Planning, 2010, Ministry of Education, Midlands Province

mathematics and less on other subjects. The reason probably stems from the role played by mathematics in determining human career and development in relation to other subjects the world over. Karl Friedrich Gauss and others have referred to mathematics as the queen of the sciences and servant of the arts (Wikipedia, 2013a; Department of Education, 2003). Thus Mathematics is viewed as a natural human activity which is important as a tool for solving everyday problems and also as a language of communication although many people consider it as a difficult, dull and painful subject to learn. Mathematics knowledge and skills can form a fundamental cognitive base for human thinking when learning other subjects. Mathematical learning is empowering but can also be demanding for everyone (MacGillivray, 2008). Regardless of its importance, it is strongly believed that mathematics has attained an unfortunate "filter status" for the majority of students in Zimbabwe (Ndemo and Mtetwa, 2010, p. 1). Mathematics is generally considered as a barrier to some students' success in high school and also as a barrier to some students' admission into post secondary education (Chan, 2003).

People have been apportioning the blame of students' poor performance in mathematics to one another without making a critical analysis of the underpinning factors. Therefore there is need to investigate these factors affecting achievement from multiple perspectives and sources so as to have a holistic approach to the solution.

Theoretical framework

What is mathematics? Why should it be studied? These

are important philosophical and educational questions which may raise further questions than answers. According to Wikipedia (2013b), there is no consensus, even among professionals, as to what mathematics is. There are two basic schools of thought, namely absolutism and fallibilism. The absolutist school of thought (Tuge, 2008; Ernest, 2004) views mathematics as only a language and a series of number or other 'games' with rules to be followed (formalism), or a logical way of thinking (logicism), or a subject whose objects are abstract, remote from everyday experiences, real and objective (Platonism). Progressive absolutists and intuitionists view mathematics as a creation of the human mind (Khait, 2005; Wikipedia, 2013b). The fallibilist school of thought (Tuge, 2008) views mathematical knowledge or objects as social or cultural results of the human activity (humanism). Fallibilists, according to Ernest (2004), also say that mathematical knowledge is not discovered but invented to serve the human being together with the society in which he/she lives (social constructivism). This study therefore adopts the 'midway' stance and defines mathematics as a subject of study involving various inter-related content areas (arithmetic, algebra, geometry, calculus, etc.) and skills (recalling, computing, application, construction, problem solving, analysis, interpretation, evaluation, etc.) pursued by the individual(s) for the purposes of personal as well as societal development.

Poor achievement in mathematics has been the subject of many educational studies in the past few decades. Skemp (1987) argues that teachers should carry the major part of the blame when they are more authoritarian and less humane in their teaching approaches. Such teachers mostly promote rote learning

or drill and memorization methods instead of learning for understanding which he calls "schematic" learning. We also believe that most teachers seldom consider and make use of the affective domain of Bloom's taxonomy of objectives when preparing instructional programmes. Anxiety, negative attitudes and wrong beliefs which fall under the affective domain are key factors which may reduce pupils' enjoyment and liking of mathematics and which may probably become the major determinant of failure.

The way the mathematics curriculum is designed affects the way it is perceived and implemented. Poor achievement usually comes as a result of negative attitudes and poor implementation of the curriculum. A weak curriculum then, is usually viewed negatively by both teachers and students. So the factors affecting achievement in mathematics can be seen from different but not so disjoint levels. These can be grouped into the following categories:

- ♦ syllabus factors: students are bound to fail mathematics if the syllabus is too long, topics too difficult, poorly sequenced, disintegrated, incoherent, etc.
- ♦ school based factors: students are bound to fail mathematics if there is lack (and poor usage) of teaching and learning facilities and if the 'school type' is not learner-friendly (Mbugua, Kibet, Muthaa and Konke, 2012),
- ♦ teacher related factors: students are bound to fail mathematics if teachers' academic preparedness (content knowledge), years of teaching experience, attitude, teaching styles, and beliefs are not adequate or positive (Silva, Tadeo, Reyes and Dadigan, 2006),
- ♦ socio-economic factors: students are bound to fail mathematics if the education and economic status of their parents are poor, or if the home environment is insecure and non-supportive due to e.g. early marriages, female genital mutilation (Mbugua, et al., 2012) or child-headed family,
- ♦ student related factors: students are bound to fail mathematics if they lack motivation and interest, lack proficiency in the language of instruction (Mji and Makgato, 2006), lack problem solving techniques or proper learning styles, and if their attitudes towards anything related to mathematics is negative including sheer sloth and what we can call 'mathephobia'.

Statement of the problem

There is need to make an in-depth analysis of the characteristic nature of the factors influencing poor performance in secondary school Mathematics.

Research questions

1. How do the various factors affect achievement in 'O':

level Mathematics such as

(a) Students, (b) teachers, (c) parents, and (d) employers?

2. In what way(s) are these factors correlated?

3. How can teachers, parents, and employers help to improve students' performance in 'O' level mathematics?

Purpose of the study

This study sought to analyse the factors affecting achievement in ordinary level mathematics in Zimbabwe using Gweru District secondary schools.

Significance of the study

This study has significant implications for teachers, parents and education officers in organising conducive learning environments and providing requisite learning materials that could lead to better achievement. It is important for students to consider all the factors affecting their own mathematics achievement so that they may be guided on how to overcome the negative factors and utilise the positive ones. Since most employers are generally worried about profit and loss issues and would want to recruit the most productive employees (or best 'O' level school leavers), this study could shed light on how schools and employers may network so as to produce the best would-be employee. Finally, the study could open more opportunities for research on factors affecting mathematics achievement using multiple data sources and instruments. It is anticipated that these factors would inform policy makers on whether to review the mathematics curriculum or to review employers' requirements for recruitment to careers.

METHODOLOGY AND DESIGN

This study employed the mixed-methods approach by using both the quantitative and qualitative techniques. The design was largely descriptive survey. Descriptive surveys are cost-effective and 'things are measured as they are' (Hopkins, 2000). Data were collected from multiple sources (students, teachers, parents, and employers) using open ended and structured questionnaires as well as interviews. Furthermore, focus group discussion was also used with a few students at each of the chosen schools in order to check on the authenticity of the questionnaire data. The philosophy guiding this 'mixing of methods' is the pragmatist perspective which draws on employing "what works," using diverse approaches, giving primary importance to the research problem and question, and valuing both objective and subjective knowledge (Cresswell, 2007; Morgan, 2007). These pragmatist views are also supported by Hannula (2009, p. 16) who

argues that, "Mathematics education research uses more elaborate methods and combines often qualitative and quantitative methods..."

Population, Sample and Sampling Procedure

The target population for this study comprised mathematics teachers and pupils, parents/guardians, the mathematics education inspector (MEI) and employers in Gweru District. These are the key stakeholders in any education system although the list is not exhaustive. Six secondary schools comprising government, mission/private, boarding, day, urban and rural categories in Gweru District were sampled and visited. From each of these schools six students (2 high achieving, 2 average and 2 low achieving in mathematics) and at least two teachers from each school were randomly selected and asked to complete the given questionnaires. Eight randomly selected parents/guardians (one or two per school) were interviewed. These were parents/guardians of the 'O' level students. Ten purposively selected employers in the City of Gweru belonging to the categories of government, parastatal, indigenous, small scale, and private/foreign employment sectors were visited and interviewed.

Instruments and Data Collection Procedure

'O' level students' questionnaire and focus group discussion

The 'O' level students' questionnaire constructed by the researchers had three sections. Section A asked for the student's bio-data including mother and father's occupation. Section B asked for perceptions and opinions about the mathematics curriculum. Specifically, it asked for information concerning the syllabus, teaching methods, learning styles, and assessment techniques. Section C asked about mathematics anxiety and career aspirations of students. It was hoped that asking these questions would provide a holistic list of the factors affecting achievement in 'O' level mathematics. After students had filled in the questionnaire, the researchers asked them whether to have the focus-group discussion (FGD) on the same day or on another day. Most students agreed that the focus-group discussion had to be conducted on the same day. On the day of the discussions, the researchers introduced themselves and told discussants the purpose of the meeting. The researchers assured the discussants that the information they would provide as a group would be confidential and their names would not be recorded. The researchers and the group agreed on simple 'house' rules of the meeting. Students were to respect each other's views and no answer would be treated as wrong. Questions that were

asked pertained to their like/dislike of mathematics and reasons thereof, their views on how teachers were teaching them, challenges they were facing in the learning process, their feelings about employers' requirements for passes in Mathematics, and what the government should do about mathematics teaching, learning and assessment policies. Each FGD had 6 discussants and the discussions lasted between 15 and 20 minutes.

'O' level teachers' questionnaire

The 'O' level teachers' questionnaire had Section A asking about biographical data such as gender, age, and qualifications. Section B asked about general views of teachers concerning the mathematics curriculum, especially issues to do with the syllabus, instructional methods, assessment methods, and specific views about factors affecting achievement. Like on the students' questionnaire, the teachers were asked to circle their choice on the given list of responses from strongly agree to strongly disagree. They also wrote their opinions, perceptions and suggestions as regards these factors on the open ended sections of the questionnaire.

Mathematics education inspectors' questionnaire

The MEI is responsible for the monitoring, supervision, and assessment of all mathematics resources, teaching, learning, and staffing that take place in all districts in the province and is answerable to the Provincial Education Director. The mathematics education inspector's questionnaire had Section A asking for biographical data (gender, age, marital status, qualifications). Section B asked generally about the 'O' level mathematics curriculum, e.g. the syllabus, perceptions about teachers' instructional and assessment methods, and specifically about factors affecting achievement in mathematics.

Interview schedule for parents of 'O' level students

Parents or guardians of the 'O' level students are important stakeholders in the education system because they provide financial, material and emotional support to the student. Some parents/guardians might also provide limited educational support in terms of checking and correcting homework done or arranging and paying for extra tutorials with experienced teachers. This study sought to find out, through interviews, the views of parents or guardians of the 'O' level students concerning why students fail mathematics, the importance of mathematics in real life and in the world of work. It also sought to establish parents/guardians' views about employers' and government's policies regarding 'O' level

subject passes. Parents/guardians were also asked how they could assist their children to do well in mathematics.

Interview schedule for employers

The interviewers asked employers to provide information with explanations on questions such as:

- How many of their employees achieved Grade C or better pass in at least five 'O' level subjects, how many have mathematics included and how many do not have mathematics?
- Do they consider the mathematics pass to be important or not,
- Do employees with passes in mathematics perform better than those who failed mathematics and,
- What do they consider to be reasons why students fail mathematics and how companies and industries could assist.

Data Analysis Procedure

Qualitative data from interviews and questionnaires were analysed question by question. Similarities or differences between different questions were noted and emerging themes or ideas pertaining to the factors affecting mathematics achievement were identified and noted. Findings were compared with related findings from previous similar research and from Review of Related Literature. For quantitative data, SPSS version 16.0 was used to perform t tests, regression analyses and ANOVA in order to find out if there were any significant mean differences, variances and relationships between variables and sub-items in each of the instruments administered to the different types of respondents. Data found from questionnaires and rating scales (measuring mathematics anxiety, attitudes and perceptions about the curriculum) would be compared with data from previous statistics (e.g. pass rates, employment figures etc.). The advantages of using such a methodology were that unclear or questionable figures or opinions would be verified by data from other sources within the same study. Quantitative data also had the advantage that hypotheses could be statistically tested and results could be generalized to a wider population (Johnson and Onwuegbuzie, 2004).

For the analysis of focus-group data, Green (2006) says:

Reliability (consistency of findings) and validity (accuracy of information) are important factors to consider in the process of data analysis. Two of the most useful tools for addressing them when analyzing focus-group data are:

1) Coding Teams – researchers code the same data and discuss their findings. Similarities and differences between results are assessed.

2) Participant Validation – researchers take findings and analysis back to the participants and ask them to review the work and provide feedback.

3) The most important element of analyzing qualitative data, including data obtained from focus groups, is to THINK!

(Green, 2006, slide No 7)

In this study, Green's item 2 as indicated above was not carried out because the researchers did not consider it necessary and prudent to go back to 'disturb' the students; an event which could likely take more of their study time and cause them some examination anxiety. Thus after careful "THINKING" analysis was done basing on item 1 as indicated above.

RESULTS AND DISCUSSION

From the students', teachers' and mathematics education inspector's questionnaires, eighteen variables were created, coded and entered onto SPSS 16.0 as follows:

OWNER (ownership of the school): Government 1, Mission/Private 2, SCHTYP (type of the school): Boarding 1, Day 2, TRSEX (sex of the teacher): male 1, female 2, STDSEX (sex of the student): male 1, female 2, STDAGE (age of the student in years): exact numerical value was entered, FROCC (father's occupation): occupations were coded in ascending order of prestige, esteem or remuneration from unemployed (0), self employed (1), factory worker (2) right up to scientist/physicist (12), MROCC (mother's occupation): similarly coded as of father's occupation, STDSYLB (students' views on the mathematics syllabus): most favourable (4-9), mixed (10-15), least favourable (16-20), STDTCHM (student's views about teaching and learning styles): positive (7-16), mixed (17-26), negative (27-35), STDASSTECH (student's views about assessment techniques): most favourable (5-11), mixed (12-18), least favourable (19-25), STDMA (student's mathematics anxiety): low anxiety (9-21), moderate anxiety (22-33), high anxiety (34-45), STDCASP (student's career aspirations): low (4-9), moderate (10-15), high (16-20), TRSYLB (teacher's views about the syllabus): positive (10-18), mixed (19-29), negative (30-40), TRINMTDS (teacher's views about instructional methods): positive (7-16), mixed (17-26), negative (27-35), TRASSMTDS (teacher's views about assessment methods): positive (5-11), mixed (12-18), negative (19-25), MEISYLB (mathematics education inspector's views about the syllabus): positive (11-26), mixed (27-42), negative (43-55), MEITRINMTDS (mathematics education inspector's views about the teacher's instructional methods): positive (8-18), mixed (19-29), negative (30-40), and MEIASSMTDS (mathematics education inspector's views about assessment methods): positive (6-14), mixed (15-22), negative (23-30).

Table 3. Means and Standard Deviations for some of the variables

Variable	Mean	Standard Deviation
STDAGE	16.2917	0.86499
FROCC	4.5833	2.78132
MROCC	3.2778	2.47976
STDSYLB	11.1666	3.03786
STDTCHM	16.1944	3.67866
STDASSTECH	12.444	3.46777
STDMA	21.1389	5.55571
STDCASP	16.6944	3.26732
TRSYLB	24.6667	4.61674
TRINMTDS	19.833	2.952
TRASSMTDS	15.750	3.3413
MEISYLB	36	0*
MEITRINMTDS	30	0*
MEIASSMTDS	26	0*

* There was only one mathematics education inspector who responded for Gweru District

Quantitative data for the students, teachers and mathematics education inspector

There were 36 students of which 17 were male and 19 female. Their average age was 16.34 years, 6 belonging to each of the 6 different schools. There were 12 teachers (7 male, 5 female) of average age range 31-40 years. Four teachers had a Diploma in Education, 7 had a Bachelors' degree while one had a Masters' degree. There was one male mathematics education inspector holding a Masters' degree and of age range 41-50 years. Table 3 shows the means and standard deviations for some of the variables:

Table 3 shows that the average "father's occupation" for the students was 4.58 (i.e., teacher, pastor, salesman categories) while the average for "mother's occupation" was 3.2778 (nurse, police officer, secretary, security officer, soldier). Very few students had their parents' occupation levels being as high as those of doctor, pilot, manager, lawyer or scientist. Low levels of "parents' occupation" can negatively affect the student's motivational level or career aspiration (Wairimu, 2012), and hence achievement in mathematics. Most students had "mixed" to "unfavourable" views about the mathematics syllabus, "mixed views" about teaching and learning styles and assessment techniques, and moderate to high mathematics anxiety. Most teachers, on the other hand, had mixed views about the syllabus, the teachers' instructional methods and the assessment methods. None had favourable views. The mathematics education inspector had mixed views about the syllabus, negative views about teachers' instructional methods and negative views about assessment methods. The teachers' and mathematics education inspector's ratings which ranged from 'mixed' to 'negative' are somehow equivalent and this might suggest that there is something

amiss in the mathematics syllabus, in the assessment techniques and in the general teaching and learning of mathematics.

Correlation coefficients were computed using SPSS 16.0 to find out whether there were any significant relationships between student and teacher related variables and how they could help to explain students' achievement in mathematics. Table 4 gives a summary of the significant correlations (at $\alpha \leq 0.05$).

In Table 4 it can be noted that STDTCHM (student's views about teaching and learning methods) was negatively correlated with SCHTYP (type of the school), which means that those with unfavourable views came from day schools while those with favourable views came from boarding schools. One can conclude that much learning is taking place in the private/mission schools (which are few and well equipped) than in the government schools (which are many in number and less equipped). STDMA positively correlated with STDTCHM, STDASSTECH and STDSYLB, implying that students with high mathematics anxiety had unfavourable views about the syllabus, teaching and learning methods and assessment methods. Thus mathematics anxiety could be a factor that negatively affects learning (and hence achievement) in mathematics. Students with high career aspirations had low mathematics anxiety and vice versa ($r = -0.564$). Ownership of the school (OWNER) had no significant correlation with STDMA, STDASSTECH, STDSYLB and STDTCHM meaning that, in this study, belonging to a government or mission/private school did not affect the way students viewed the syllabus, teaching and learning styles and assessment methods.

Some trial models for regression and ANOVA were run to find out whether factors affecting students' achievement could be explained by some relationships or equations. It was found that STDASSTECH, STDSYLB

Table 4. Significant correlations between some of the variables

Variables	Correlation	P value (2 tailed)
TRINMTDS and TRASSMTDS	0.604	0.000
STDTCHM and SHTYP	-0.498	0.002
STDSYLB and STDTCHM	0.708	0.000
STDSYLB and STDASSTECH	0.511	0.001
STDTCHM and STDASSTECH	0.734	0.000
STDMA and STDTCHM	0.541	0.001
STDMA and STDASSTECH	0.587	0.000
STDMA and STDSYLB	0.547	0.001
STDMA and STDCASP	-0.564	0.000
OWNER and STDMA	-0.107	0.536*
OWNER and STDSYB	-0.075	0.665*
OWNER and STDASSTECH	0.116	0.500*
OWNER and STDTCHM	0.120	0.486*

The star (*) shows that correlations were not significant ($p>0.05$)

Table 5. Factors according to themes and at student, teacher, parent, MEI and employer levels

Theme	Student	Teacher	Parent	MEI	Employer
Math anxiety and attitude	Yes, very important factor according to students	Wrong perception, negative student attitude	Pupils do not ask for help, scared of teachers	Attitude of most students is negative	Fear of subject (strong factor)
Lack of resources, school environment	Yes, moderate factor	No textbooks, Revision time too short	Shortage of textbooks, English language for teaching Maths is difficult	Resources not enough to support teaching methodologies	Yes, moderate factor
Teacher lack of content and methodology	Yes, strong factor	Poor mathematical background	Inefficient teachers	Teachers lack content and methodology skills	Poor coaching technique by teachers
Peer or parental pressure	Not mentioned	To some extent	Not mentioned	Not mentioned	Yes, moderate factor
Poor curriculum	Syllabus too long, some topics are very difficult and not useful	Not mentioned	Syllabus is not likeable by pupils	Yes, moderate factor	Pupils lack real life skills
Low teacher morale/ heavy loads/low salaries	Teachers have negative attitude and are not motivated to teach	Low morale due to heavy loads	Teachers have low salaries	Not mentioned	No incentive for teachers
Unfair Zimsec practices/poor assessment techniques or strategies	Exam shocks students, teachers give corrections without explanation	Not mentioned	Some parents lack knowledge to assist pupils with homework	Exam does not assess practical skills	Not mentioned

and TRINMTDS were significant predictors of STDMA and explained 51.1% of the variance ($F=11.132$, $p=0.000$). Other trial models failed to produce significant relationships.

Qualitative data

Apart from students and teachers who gave their views on the questionnaires, 8 parents and 10 employers were

interviewed. For ease of comparison and analysis, the factors affecting achievement are hereby grouped according to the respondents, ie. at the student level, teacher level, mathematics education inspector level, parent level, and employer level and are presented as themes in Table 5.

Table 5 shows that the mathematics anxiety/attitude factor was mentioned by all levels of respondents. This brings about a challenge to the teachers and students to find ways to deal with this 'mathephobia' and build positive beliefs and attitudes. Resources (including especially textbooks) which were not enough to support teaching and learning were another factor mentioned by all groups of respondents. Teachers who lack content and pedagogical skills also had their blame in contributing to poor achievement. It can also be seen in Table 5 that students did not blame their parents, teachers did not blame the curriculum nor the Zimbabwe School Examinations Council (Zimsec), parents did not blame themselves for the children's poor performance while the MEI did not blame parents nor the supposedly heavy loads and low salaries of the teachers. While the employers did not directly blame Zimsec for poor achievement, they mentioned that school leavers come to work in their companies having book knowledge but no real life skills, and this could be viewed as a point impacting negatively on the curriculum and the assessment techniques.

Most employers were reluctant to provide statistics for their employees, in particular, previous mathematics pass grades. They however pointed out that employees who held good "O" level mathematics passes produced better results at work than those who had failed mathematics or those who had not written mathematics at all. It was also revealed that employees who had better academic qualifications (including mathematics) had more take home pay than those without. Hence it can be inferred that the aspiration or ambition to earn a better salary is a factor that could motivate a student to do well in mathematics (since those with a mathematics pass have an increased chance of earning more than those without).

During focus group discussions with students, it was revealed that lack of dedication, practise and perseverance by students, unfair Zimsec practises, undedicated and less knowledgeable teachers and shortage of teaching and learning resources (especially textbooks) were contributing factors to poor achievement, and these reasons seem to agree with those given in Table 5.

Research question 3 asked how teachers, parents and employers could help students to improve their performance in "O" level mathematics. Teachers pointed out that they needed staff development in order to improve their instructional methods. Parents mentioned that they could discuss with their children the importance of mathematics, give children enough time to do homework (and/or extra lessons), assist them with

homework and check their exercise books regularly. Employers said they could assist by donating resources (like books, pens, uniforms and food) to those in need, giving incentives to the best mathematics teachers and giving students attachment in their companies so that those students would see (and perhaps envy) how mathematics is applied in industry. Other strategies to help students do well in Mathematics could be inferred from the themes (factors) given in Table 5.

CONCLUSION AND RECOMMENDATIONS

This study analysed the factors affecting achievement in "O" level mathematics in Gweru District from multi-sources or levels (students, teachers, parents, employers, mathematics education inspector) and using various instruments of multi-case study approaches (interviews, questionnaires, and focus group discussions). It was initially intended to give a mathematics achievement test to the students, but this was not done due to time constraints and logistical problems. The study also sought to establish if there were any relationships between these factors and asked how parents, teachers and employers could help students to do well in mathematics. Mathematics anxiety (STDMA, which also incorporates attitude to mathematics) was the most often mentioned factor and appeared at all levels of the respondents. It was found that there were some significant correlations between the factors and that regression analysis model and ANOVA explained some variation between STDMA and other variables.

This research has shown that a student's learning and achievement are influenced by a variety of factors and these could be related to the student him/herself, peers, teacher, school, curriculum, family, etc. However, Gutfreund and Rosenberg (2012) believe that among those factors directly affected by educational policy are the teacher related ones such as skills, knowledge, views, and instructional methods. Hence people should not apportion the blame to one group without making a critical analysis of these factors.

Basing on the findings of this study and also from the review of related literature, the following recommendations are made:

- ♦ Teachers should make mathematics anxiety and negative attitude to mathematics discussion topics in every mathematics classroom and use researched strategies to deal with them.
- ♦ The mathematics curriculum should be reviewed and streamlined to meet real life work experiences of the school leavers.
- ♦ Teachers must regularly undergo in-service training in mathematics content and methodology areas so that they keep abreast with modern technology developments.

- ♦ The responsible school authorities should provide the necessary supporting resources to the students and the morale and sufficient allowances to the teachers.
- ♦ There is need for further research, perhaps including other variables such as students' achievement in the form of real math test scores.

Conclusion

The paper has presented a succinct perspective of the role played by Mathematics in the world of work and careers as well as academic appraisal.

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