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High Failure Rate in Mathematics Examinations in Rural Senior Secondary Schools in Mthatha District, Eastern Cape: Learners' Attributions

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ABSTRACT This study sought to investigate learners' attributions on high failure rate in Mathematics examinations in rural senior secondary schools in the Mthatha District of Education. A survey design which used both quantitative and qualitative aspects of research was used in the study. Questionnaires and interview schedules were used to collect data. Participants (N=150) were made up of 75 boys and 75 girls from senior 10 secondary schools. Descriptive statistics and content analysis were used to analyse quantitative and qualitative data respectively. A frequency table was used to present quantitative data while qualitative data were presented thematically. The study revealed that learners attributed their failure mainly to external factors such as lack of human and material resources, poor teachers, poor teaching methods and bad teacher behaviour. Some learners attributed their failure to internal factors like laziness, lack of interest and absenteeism. Recommendations to improve learners' performance in mathematics were made.

INTRODUCTION

The importance of having a solid background in mathematics is well recognized as it serves as a gateway to future professions in a variety of fields (Tella 2008; Pandor 2006; De Klerk Wolters cited by Kurt et al. 2002). Mathematics is very important in our daily lives since it deals with real life situation in our daily activities (Ojose 2011). A thorough understanding of mathematics is an asset, if not essential, for applicants interested in obtaining better employment the world over. In other words, mathematical competence is an essential component in preparing numerate citizens for employment and it is needed to ensure the continued production of highly-skilled persons required by industry, science and technology (Mikulski 2001; Steen 2001; House 2006). According to Steen (2001), mathematics does not only empower people with the capacity to control their lives but also provides science a firm foundation for effective theories; it also guarantees society a vigorous economy.

The world's technological advances today involve a solid mathematical background which leads to job opportunities in the world (NCTM nd; Steen 2001; Kahn 2001). At its most basic level, mathematics is a requirement for science, computer technology and engineering courses. This is based on the fact that from homes to the workplace, technological tools have become a part of our day-to-day life activities. Because of the importance of mathematics, already highlighted above, schools must respond with effective teaching and learning of mathematics from grade one to university level (Department of Education 2000).

Despite the importance of mathematics highlighted above, learners continue to fail the subject (Feza-Piyose 2012). Maree et al. (2003) and Steyn and Maree (2003) cited by Maree et al. (2006) reveal that the failure rate in mathematics in South African schools is unacceptably high. Similarly, Mkgato and Mji (2006) cite several studies pointing to high failure rate in mathematics in South Africa in comparison with other countries. Examples of such studies include: Beaton et al. (1996), Howie (2001, 2003), Centre for Development in Education (2004), Naidoo (2004), Reddy (2004) and UNESCO/ UNICEF: Monitoring Learning Achievement Project (2005).

While South African learners are generally not performing well in mathematics, the situation is even worse among Black South African learners (Brodie 2004). Kahn (2001) presents the failure rate for Black Grade 12 learners in mathematics in 1999, 2000, 2001 and 2002 as 88.3%, 84.5%, 80% and 76.8% respectively.

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An analysis of mathematics results over a five year period, 2004 to 2008 in Mthatha district, Eastern Cape in some selected schools in Table 1 shows an alarming rate of failure in the subject.

Table 1: Record of results for Mathematics in selected Mthatha secondary schools for the past five years

Schools	*Year*	*Pass Rate*
School 'A'	2004	14.5%
School 'B'	2005	17%
School 'C'	2006	21.4%
School 'D'	2007	28%
School 'E'	2008	23.6%

Source: Mthatha Department of Education Results 2004, 2005, 2006, 2007 and 2008.

The performance of the learners in the selected schools above clearly indicates that the pass rate is low. It is against this background of poor performance in mathematics in South Africa in general and in Mthatha district in particular that the researchers sought to establish the factors learners attribute the high failure rate to. From the researchers' point of view, not much research focusing on mathematics high failure rate have been conducted in the Mthatha district yet the examination results continue to be unsatisfactory in the subject (mathematics) which is a key subject for the country's development. It is against this background of poor performance in mathematics that the present study would want to establish learners' attributions on high failure rate of mathematics in Mthatha district.

Theoretical Framework

The study is based on Weiner's (1980, 1992) attribution theory. The concept attribution describes the cognitive process by which a person perceives the cause of what has happened to him/her either as caused by himself/herself or by others (Asonibare 1986). According to the attribution theory, we tend to explain the causes of success or failure to either internal or external factors. That is, we succeed or fail because of factors that we believe have their origin with us or because of factors that originate in our surroundings. There is an element of whether we control or do not control the success or failure. This is related to Rotter's (1954, 1966) locus of control concept which refers to the extent to which individuals believe that they can control events that affect them. Individuals with an internal locus of control believe that events result primarily from their own actions. Those with an external locus of control believe that other peoples (for example, teachers), fate, bad luck or chance primarily determine events (Vijayashree and Jagdischchandra 2011). An important assumption of the attribution theory is that we will interpret our environment in such a way as to maintain a positive self-image. That is, we will attribute our successes or failures to factors that will enable us to feel as good as possible about ourselves. For example, when learners succeed in an academic task, they are likely to attribute the success to their own efforts or abilities and when they fail, they will attribute failure to factors over which they have no control, such as lack of resources.

Weiner's attribution theory applies to this study in that learners are most likely to attribute their high failure in mathematics to external factors like mathematics is difficult, teachers are incompetent, teachers are not serious and to internal factors like not working hard or having a negative attitude towards mathematics.

Goals of the Study

The present study sought to investigate learner attributions on their high failure rate in mathematics in Mthatha district. The main research question addressed in this study was: What do students attribute their high failure rate in mathematics in Mthatha district to?

METHOD

Design

A survey design which employed the use of both qualitative and quantitative aspects of research was used. The survey design is normally used where participants' opinions are sought (David and Sutton 2004). In this study, learners' attributions were sought hence the survey design.

Sample

The sample for the study comprised of 150 metric learners (75 boys; 75 girls) drawn from 10 Mthatha secondary schools. The schools from

which the learners were sampled were conveniently selected based on their accessibility and performance from specified ranges. Stratified random sampling was employed in selecting learners for this study. This sampling technique was used to ensure that every possible characteristic of the learners was accounted for.

Instrument

A questionnaire was used to collect data. A pilot study was conducted to check on the relevance and usability of the instrument before the main study.

Procedure

The questionnaires were personally distributed by one of the researchers. Learners completed the questionnaires under the supervision of their respective class teachers to ensure that they did not share their views. The researcher collected the student completed questionnaires from those class teachers after completion.

Ethical Issues

Permission was granted by the Eastern Cape Department of Education and the principals of the participating schools before the study was conducted. Consent forms were given to the participants to document their consent to participate in the study. Consent forms were also given to 30 parents of under eighteen years learners to document their consent for their learners to participate in the study. Confidentiality was ensured by asking participants not to write their names on the questionnaire. Individual respondent's score were not identified in the presented group data.

Data Analysis

Frequency distribution and percentages were used to analyse quantitative data. Qualitative data was analysed through grouping the responses into categories or themes.

Results

Quantitative results are presented first in the Table 2 while qualitative are presented after the quantitative results.

Table 2 shows that the majority of the learners believed they failed mathematics because of the following external factors: classroom environments for mathematics lessons not stimulating (55.5%), teachers did not discuss learners' mathematical problems (58.7%), teachers did not use effective teaching methods (62.1%) teachers were not always in class to teach mathematics (72.8%), mathematics is naturally a difficult subject (75%), teachers are not competent to teach mathematics (79.2%). The learners also believed they failed because of the following internal factors: learners' attitudes towards mathematics are negative (76.3%) and that learners did not come to school regularly (60.4%).

Reponses from Open-end Questionnaire Items

Teachers' Behaviour

Learners attributed their poor performance in mathematics to teachers' behaviours. Explanations given by learners to support this assertion include: Teachers absent themselves from school and classes; teachers insult learners in class for giving wrong answers, teachers do not motivate learners in class and teachers always beat learners in class.

Shortage of Material and Human Resources

Learners also attributed their performance in mathematics to shortage of mathematics teachers. Explanations given supporting the above point include: The few mathematics teachers available in schools could not teach all the classes in the school before the end of the day. Grade 12 learners normally had mathematics periods twice a week due to a shortage of mathematics teachers. Learners could not finish a lot of topics before examinations as a result of a teacher shortage. Teachers could not get time for remedial work due to an increased number of periods allocated to them. The students also attributed their high failure in mathematics to overcrowded classes and lack of mathematics textbooks for each of them.

Incompetent Mathematics Teachers

The majority (60%) of the learners attributed their high failure rate in mathematics to in-

Table 2: Learners' views on why they fail mathematics

Item	*Response*		
	Response	*Frequency*	*Percentage (%)*
Learners fail Mathematics because the classroom environments are not always stimulating	Strongly Agree	23	15.8
	Agree	58	39.7
	Disagree	52	35.6
	Strongly Disagree	13	8.9
Learners fail exams because their attitudes towards mathematics is negative	Strongly Agree	49	33.1
	Agree	64	43.2
	Disagree	17	11.5
	Strongly Disagree	18	12.2
Teachers discourage learners from learning mathematics by not adequately discussing their Mathematical problems with them	Strongly Agree	21	14.2
	Agree	40	27
	Disagree	52	35.1
	Strongly Disagree	35	23.6
Learners fail Mathematics because teachers are not always in the classroom to teach the subject	Strongly Agree	55.	37.4
	Agree	52	35.4
	Disagree	36	24.5
	Strongly Disagree	4	2.7
Mathematics is naturally a difficult subject	Strongly Agree	49	33.1
	Agree	62	41.9
	Disagree	26	17.6
	Strongly Disagree	11	7.4
Learners do not come to school regularly and therefore do not understand what is taught in their absence	Strongly Agree	30	20.1
	Agree	60	40.3
	Disagree	34	22.8
	Strongly Disagree	25	16.8
Teachers use teaching methods that learners do not easily follow when learning mathematics	Strongly Agree	32	21.6
	Agree	60	40.5
	Disagree	40	27.0
	Strongly Disagree	16	10.8
Teachers are competent to teach mathematics	Strongly Agree	18	12.1
	Agree	28	18.9
	Disagree	53	35.6
	Strongly Disagree	50	33.6

competent mathematics teachers in their schools. The explanations given in support of incompetent mathematics teachers affecting learning of mathematics included the following: teachers who do not have qualifications in teaching mathematics are unlikely to be aware of the way to assist learners in solving problems in mathematics (Some students new about teacher qualifications because teachers' qualifications were displayed in the staffrooms at most schools); some teachers do not know all the chapters in mathematics so sometimes it is difficult for them to solve problems for learners as far as past questions papers are concerned; some of these teachers do not come to school at all in order not to be humiliated by the learners in class; some teachers also come to class unprepared because they do not know where to start from and some teachers stick to topics in which they are well versed for quite a number of weeks thereby leaving others topics uncovered.

Learners' Efforts in Studying Mathematics

The learners also attributed their poor performance in mathematics to lack of effort by some of them. The explanations given supporting this attribution included the following: Some learners are lazy, most learners are not able to answer past mathematics question(s) simply because they do not revise at all both at home or at school and some learners know that mathematics is difficult so they do not put any effort in it.

DISCUSSION

The study established that learners mainly attributed their failure in mathematics to external factors. The learners mostly believed that they failed the subject because of reasons they could not control. One of the external factors attributed by the learners was lack of qualified

mathematics teachers. The students believed that they could not pass the subject because many of their schools lacked qualified mathematics teachers to direct the learning of the subject. Because of the lack of training, the students believed that their teachers could not: adequately discuss mathematical problems with them, create stimulating classroom environments for learning mathematics and that the teachers could not use appropriate teaching methods resulting in their failure. Attributing learner failure in mathematics to lack of skill has been alluded to by Du Preez (2004) who posited that learners could not do well in mathematics when their teachers who were suppose to guide 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 the schools. The students thus believed they failed the subject because there was no one to teach them the subject even the under qualified teachers. It may be interesting to note however, that learners often fail mathematics even if they were taught by highly qualified teachers. Attributing learner poor performance to teachers' use of poor teaching methods when teaching mathematics confirm findings by Nyaumwe et al. (2004) 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. Similar attributions were expressed by the Department of Education (2001) which revealed that outdated teaching practices due to a lack of qualified human resources resulted in poor teaching standards and poor performance in South Africa. Agyeman (1993) cited in Tella (2008) also state that teachers who are professionally under-qualified in mathematics would have a negative influence on the teaching and learning of the subject. This negative influence will contribute to the high failure rate of mathematics in examinations.

The other external factor that students attributed to their failure of the subject was lack of material resources. There were no enough textbooks for mathematics. Similar findings were established by Nyaumwe et al. (2004) who attributed Zimbabwean students' poor performance in mathematics to lack of resources. In a similar vein, Portugal students' poor performance in science examinations was attributed to poor classroom decorations and lack of resources (Zacharia and Barton 2004). A factor related to lack of material resources was shortage of classroom space. The students revealed that they could not perform well in mathematics because the classes were overcrowded. The implication is that the overcrowding disturbed their learning.

It also emerged from this study that students attributed their failure to teacher behaviour such as absenteeism, insulting and not motivating learners. Some teachers were alleged to come to school drunk and did not concentrate on teaching the subject. Some teachers were also alleged to 'de-motivate' learners in class even if they gave the right answers during class discussions. The finding attributing learner failure to teacher behaviour confirms that of Kolenski (2009) who argued that a student may develop a strong dislike for a certain subject whose teacher habitually ridicules him or her in front of his/her peers.

Learners from this study also attributed their failure to the belief that mathematics is naturally difficult. This implies that the learners believed that mathematics was by nature difficult and there was nothing they could do to pass. The naturally difficulty nature of the subject was supposedly beyond their control. Similar findings were found by Cao and Bishop (2001) who established that Australian learners attributed their failure in mathematics to task difficulty. Learners are most likely not to put any effort because of the belief that the subject is difficult.

The finding that learners in this study mainly attributed their failure to external factors confirms earlier studies on students' attribution of success or failure. Examples of such studies include: Noel et al. (1987), Addiba (2004), Chireshe et al. (2009), Ojo and Wale (2011) and Mkumbo and Amani (2012).

It was interesting to note that learners in this study also attributed high mathematics failure to internal factors. That is, the learners blamed themselves for the failure. The internal factors included negative attitudes towards the subject, laziness and not attending mathematics lessons. One cannot perform well in a subject he or she is not interested in. Laziness and lack of interest results in the learner not putting any effort. The motivation for the subject will obviously be low. Learners with a positive attitude towards mathematics have been found to perform better

in the subject and vice versa (Ma 1997; Lewis 1995). It may be inferred from the finding on internal factors that learners who pass the subject may claim responsibility for the success. They may claim that they passed the subject because they have put more effort in it hence the success. Acknowledging failure due to lack of interest, laziness and absenteeism helps the learners believe that they can succeed if they develop an interest in the subject and always attend lessons next time. This sense of control is a key variable for learners' success in school (Boruchovich 2004).

CONCLUSION

From the findings of this study, it can be concluded that learners mostly attribute their failure to external factors which they cannot control. Their message is that they are failing not because of their own making but because of factors that may be emanating from their learning environment. The external factors include poorly qualified mathematics teachers and lack of resources. The learners also attributed failure to themselves. The internal factors included negative attitudes towards the subject and absenteeism.

RECOMMENDATIONS

From the findings of this study, the following recommendations are made: There is the need to improve the quality of mathematics teachers. The Department of Education should embark on serious in-service training of mathematics teachers to equip them with skills for teaching mathematics in schools. Teachers should be in-serviced in the use of learner-centred teaching methods that are appropriate and that make the learning of mathematics interesting.

Teachers should embark on team-teaching in order to make mathematics teaching/learning more enjoyable for learners. Alongside training of teachers is an aspect of providing guidance and counselling services to teachers so that they can be role models. Through guidance and counselling services, the teachers may overcome some unprofessional behaviours such as coming to work drunk and absenteeism.

Learners need to be motivated by their teachers and significant others so that they develop a positive attitude towards mathematics. Teachers and significant others for example parents should help learners develop a sense of having the ability to succeed in mathematics. Learners need to be continuously informed that they will succeed if they put their best effort. The motivation learners should receive may include exposing them to the benefits of learning mathematics and making mathematics relevant and interesting. The motivation may be done through career guidance and counselling sessions. The learner absenteeism challenge may also be addressed through guidance and counselling services provisions.

The Department of Education together with parents should supply adequate material resources such as mathematics text books and the building of more classrooms.

There is need for research to establish mechanisms that will try and shift external attributions to internal attributions so that the learners can control and feel personally responsible for their performance. There is need for future studies that may look at learner attribution by sex.

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