

## Investigating Factors Contributing To Learner Performance in Mathematics: A Case Study of Some Selected Schools in Motheo District

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**ABSTRACT** This study investigated factors contributing to learner performance in mathematics in some selected schools in Motheo District. Three schools made up of – one secondary school (in Mangaung); two secondary schools (in Botshabelo) in Motheo District. Seven educators from each school comprising of three male and three female educators teaching mathematics and one head of department for mathematics were sampled from the population. A quantitative research method has been used to gather data regarding factors that contributes towards learner performance. Factors are: the attitudes of learners towards mathematics; the use of English; and experience of teachers; the resources provided by the department of education and also the support from learner's parents. It has been found that learners are demotivated by their parents and peers saying that mathematics is the difficult subject which needs clever people. In conclusion teachers and parents must be actively involved in the education of learners.

### INTRODUCTION

Learners in most secondary schools in the district of Motheo perform poorly in the learning area of mathematics due to number of reasons known and unknown to the authorities. The country encountering spiralling results in terms of secondary schools learners' performance in mathematics when comparing to others in the continent. Various interventions strategies have been given to resolve the problem and improve learner's performance in mathematics especially with the projected provision of engineers and mathematicians. There are a number of areas like Motheo District in Free State South Africa that have to provide locally produced experts in the field that rely on mastering mathematics. There is a great need of cultivating strong and dedicated local mathematicians that will feel compelled to serve their immediate population rather than to rely on hard to get imported skilled personnel.

### Background of the Study

There are some studies which have been conducted in this topic (Saiduddin 2003: 22) regarding poor performance at high schools, the result reveals that in many cases the level of academic performance in urban and rural areas is not the same. Adell (2002: 91) argues that poor performance at high schools is an international problem particularly in mathematics.

Findings from countries such as Tunisia, Mauritius, Malawi, Zambia, and Senegal, indicated that South African learners ranked fourth out of ten countries with an average literacy score of 48.1 percent and rated last with respect to numeracy, scoring at 30.0 percent (Department of Education 2001a).

In their studies Nyabuto and Njoroge (2014: 19) indicate that learners whose parents are hands-on in their education, no matter their socio-economic status and their backgrounds are more likely to perform well in the learning area. Most of these learners tend to be motivated by their parents and work hard to get credits or higher marks to be promoted to higher grades. The involvement of parents again plays an important role in the behaviour of a learner at school as well as in mathematics as a learning area. These help learners go further with their studies because when they pass, they will be motivated to work harder at school.

The other thing which can motivate learners is when they are playing mathematics game. They can be introduced to computer games which have the mathematics concepts (Ernest et al. 2013: 16,131). These can include groups amongst the class where they can assess themselves and score points.

Oguntola (2010) is of the opinion that scientific evidence overwhelmingly supports the importance of adolescents watching their diet to ensure it is adequate. Experts say that inadequate intake of nutritious food compromises school performance of adolescents, potentially contrib-

uting to their low scores in important subjects like mathematics. Furthermore, Oguntola (2010) states that "such malnourished adolescents have lower IQs and lower school performance with poor physical and cognitive productivity and lower lifetime earning potential. They grow to become malnourished adults and this undermines not only their educational attainment but also labour productivity, with adverse implications for income and economic growth."

Education and training during apartheid was characterised by the underdevelopment of human potential, generally and that of Blacks in particular. The teaching and learning of mathematics, science and technology were the hardest hit (DoE 2001 a). Several studies (for example, Howie 2003) have reported a number of shortcomings in the teaching and learning on mathematics and science in South Africa. For example, the Third International Mathematics and Science Study (TIMSS) conducted in 1995, in which South Africa participated with 41 others, reports that South African mathematics learners came last with a mean score of 351 (Makgato and Mji 2006: 253).

The research examples presented here paint a gloomy picture of the state of the teaching and learning of mathematics and science in South Africa. This country is in need of suitably qualified teachers, doctors, scientists and many other scientifically oriented professionals. With the status of mathematical and scientific literacy generally poor in the entire schooling system (Howie 2003; Center for Development in Education 2004), it is conceivable that such system will not be able to produce enough learners who qualify to enrol at universities to pursue further SET studies.

According to the Maths Centre for Professional Teachers (2010) schools in general also did show a lot of improvement in the matric results due to Maths Centre interventions, support and guidance. Rantsane Secondary school improved their pass rate from 41 percent in 2008 to 80 percent in 2009 and Selelekela Secondary School has recorded an improvement of 100 percent in their 2009 performance.

### Literature Review

A number of studies have been conducted on the impact of several factors with regard to

performance of learners in mathematics in secondary schools.

Makgato and Mji (2006: 261) identified a number of factors that contributes to poor performance of learners in Mathematics. They have grouped them into two, and they are direct and indirect influences that have a role in the outcomes of results regarding mathematics.

### *Indirect Influences*

Here, two areas are classified under this category of factors. These related to (a) Parental role and (b) Language. Both learners and their educators identified parents as very important participants that affected or could play a role in improving learners' performance at school. In spite of this identified importance, it seems both parties agreed that parents were however not involved. Both authors, Makgato and Mji (2006: 261) highlighted the importance of educators' advice of the problem of learners taking subjects whose content parents did not understand.

Many children suffer from unpredictable home environments such as parents being arrested for always quarrelling due to substance abuse. The presence or availability of parents is crucial since they provide information, learning opportunities, behavioural models, and connection to other resources. The absence of such support severely limits these transactional protection processes and results in learners having a low self-esteem. According to Saiduddin (2003: 88), educators should create a positive school environment for learners to feel at home at school in such a way that they can openly discuss what prevents them from performing to the required standards.

With respect to the language of instruction, as highlighted by Makgato and Mji (2006: 261), it was apparent from the interviews that learners had problems. Some learners complained that it was difficult to understand some of the concepts used in both mathematics and physical science. In one way, the language of instruction- English in this case - is generally a problem on its own. Considering that mathematics use a language sometimes peculiar to the subject, overlaps in usage tend to affect learners' understanding of the subject and result in alternative conceptions. Educators corroborated the language problem. Most felt that it was sometimes difficult to explain things in the vernacular because

it brought confusion and a misinterpretation of ideas.

Buthlezi (2012) opined that the problem is that learners do not have engineering role models and also do not have an understanding of how the profession is shaping their world and consequently do not even consider the possibility of choosing engineering as a career.

### ***Direct Influences***

Factors with a direct influence related to teaching strategies, content knowledge, motivation, laboratory use, and non-completion of the syllabus content over a year. Such issues include the provisioning of resources at the schools, and perhaps importantly an enabling environment that encompasses educators' pedagogical content knowledge (PCK). PCK is described to relate to: ways of representing the subject which makes it comprehensible to others ... [it] also includes an understanding of what makes the learning of specific topics easy or difficult... (Reddy 2007: 49). This is consistent with findings that learners admired good personal qualities and teaching techniques, as well as teachers who were patient and explained things clearly (DoE 2000a). Desirable teacher qualities are reportedly linked to good subject knowledge, teaching skills and classroom management, relationships with learners, dedication, accessibility, and hard work (Reddy 2007: 50).

Another direct factor brought forward by Makgato and Mji (2006: 264), is that it has been argued that "a common maxim in the educational profession is that one teaches the way one is taught" (Thomas and Pedersen 2003: 319). This suggests for example that an educator who was educated in an incompetent manner will have learnt bad practice and is likely to use such in teaching others.

According to Reddy (2007: 66), it is critical therefore those educators are involved in refresher courses, which because they will be conducted by different people, should hopefully result in changes from their normal practice. In a sense, motivation is a function of confidence. It should follow that if educators are confident with respect to knowledge of the subjects they teach, have a grasp of common misconceptions learners present in the classroom, and possess strategies for inducing learners 'conceptual change through PCK then motivational issues would be much easier to handle.

The decline of performance at high school as compared to a learner's performance at primary school could be due to tighter academic standards where hard work and creativity are necessary to cope, in addition to less personal attention and fewer opportunities to participate in classroom decision-making (Berg 2003: 530-631).

### **Statement of the Problem**

Learners who study mathematics as a learning area struggle to cope with comprehension of the learning content due to a number of factors. It is very much desirable to understand and provide solutions to the reasons that inhibit the poor performance of learners in the learning area of mathematics.

### **METHODOLOGY**

In this research, quantitative research method using a survey method was used. Data collected from sampled schools in the study was used to evaluate influences and factors that enhance the learning of mathematics. In this report, those factors that influence the learning of mathematics are treated as problems and as the result of several causes that are present in our schools, homes where learners live as well as in external structures like the department of education.

The main research question that guided this study is:

What are the factors that lead to poor performance of learners in Mathematics in some secondary schools in Motheo District?

The following are four operational sub-questions:

- What is the attitude of learners towards mathematics?
- How is the use of English affecting the teaching and learning of mathematics?
- How parental involvements can affects the teaching and learning of mathematics?
- How is the provision of learning resources for mathematics at schools?

### **Sample**

Three schools made up of – one secondary school (in Mangaung); two secondary schools (in Botshabelo) in Motheo District. Seven educators from each school comprising of three male

and three female educator's teaching mathematics and one Head of Department for mathematics complemented the sample deemed representative for the population of the investigation. If the subjects are offered by only one gender representation (that is, if they are only offered by men or women) that teacher complemented the sample deemed representative for the population of the investigation.

### Data Collection Procedure

Data was collected by means of questionnaires and related literature consultation. Educators and HoD's were personally given questionnaires to respond on their own from their homes at own spare time because they could not respond to them at schools because that have been seen as disturbing their work-times.

## FINDINGS

The responses from the questionnaires in terms of returning the questionnaires were as the researchers expected. All twenty-one (n=21) questionnaires were responded to which made it 100 percent. Of all whom responded seven (7) from the school in Mangaung returned answered and those from Botshabelo schools fourteen (14) returned the questionnaires answered.

Hereunder is an outline on Section A of biographical information of the responders.

### Section A

#### *Item 2.1. Talks about gender difference of the participants*

Eleven (n=11) which makes 52.4 percent male educators responded and ten (N=10; 47.6%) female educators responded to the questionnaires (Table 1).

**Table 1: Gender difference**

| Gender | No. | %     |
|--------|-----|-------|
| Male   | 11  | 52.4% |
| Female | 10  | 47.6% |

Table 2 indicates the age differences of educators at the three schools who teach mathematics.

#### *Item 2.2. Ask about age difference of educators*

The indication herein is that the largest number of teachers who teach the subject are of the

ages between 31 – 40 (n=8) 38 percent, followed by the ages of 41 and above (n=6) 28.7 percent, and ages between 20-25 (n=4) 19 percent and lastly the ages between 26-30 (n=3) 14.3 percent.

**Table 2: Depiction of age differences**

| Age group    | Age | %    |
|--------------|-----|------|
| 20-25        | 4   | 19   |
| 26-30        | 3   | 14.4 |
| 31-40        | 8   | 38   |
| 41 and above | 6   | 28.6 |
| Total        | 21  | 100  |

#### *Item 2.3: Biographical information of educators according to quintiles classification*

The educators were asked to explain the socio-economic status of the school which is described according to "quintiles". According to Western Cape MEC for Education in Western Cape Mr D Grant (2013) all South African public ordinary schools are categorised into five groups, called quintiles, largely for purposes of the allocation of financial resources. Quintile one is the 'poorest' quintile, while quintile five is the 'least poor'. These poverty rankings are determined nationally according to the poverty of the community around the school, as well as, certain infrastructural factors. Each quintile, nationally, contains 20 percent of all learners, but not 20 percent from each province. Schools in quintile 1, 2 and 3 have been declared no-fee schools, while schools in quintiles 4 and 5 are fee-paying schools.

In the responses given by responders, the schools in this study were indicated as belonging to quintiles 1, 2 and 3.

**Table 3: Position of educators**

| Positions | No | %    |
|-----------|----|------|
| Educators | 14 | 66.7 |
| HoDs      | 7  | 33.3 |
| Total     | 21 | 100  |

*Item 2.4 of the Section A captured the positions of the responders and seven (7) were HoD's and the rest were 14 educators (Table 3).*

*Item 2.5 captured the qualifications of the educators and the following was captured (Table 4).*

**Table 4: Qualifications of educators**

| Qualifications | No. | %    |
|----------------|-----|------|
| Matric         | 0   | 0    |
| Diploma        | 4   | 19   |
| Degree         | 14  | 66.7 |
| Post Graduate  | 3   | 14.3 |
| Total          | 21  | 100  |

### Section B

This section required the “Yes” or “No” answers to pertinent questions regarding the daily execution of duties by educators and HoD’s and their responses were captured in Table 5.

### Section C

Section C is dealing with material which is needed to solve mathematical problems at school. Discussion of the topics which seen to be difficult to learners (Table 6).

**Table 6: Discussion of the topics which seen to be difficult to learners**

| Topics               | No. of respondents | % of respondents |
|----------------------|--------------------|------------------|
| Factorisation        | 8                  | 38               |
| Simplification       | 0                  | 0                |
| Trigonometry         | 11                 | 52.4             |
| Geometry             | 13                 | 61.9             |
| Data Handling        | 6                  | 28.6             |
| Analytical Geometry  | 5                  | 23.8             |
| Transformation       | 2                  | 9.5              |
| Functions and Graphs | 7                  | 33.3             |

*Item 3.1 Do you think mathematics is important to learners?*

According to findings from the educators and HoDs of three different schools in Motheo District below are the answers (Table 7).

*Item 3.2. What problems do you most experienced in mathematics?* Here majority of edu-

**Table 7: Educators’ responses to whether mathematics is important to learners**

| Yes |       | No |      |
|-----|-------|----|------|
| 20  | 95.2% | 01 | 4.8% |

cators (16 respondents) talk about lack of resources and they say that learners have to know English first as the medium of instruction at our schools, whereas 5 of them did not respond to the question. Some say that learners are not used to practice they work regularly they just do their work only during school hours after school they just leave their books at home and meet their friends. Which they will lead to peer pressure influence if they are having negative attitude towards mathematics.

*Item 3.3. Does your school have mathematics laboratory? If Yes does it have enough resources (Table 8)?*

**Table 8: Educators’ responses about whether their schools have mathematics laboratory**

| Yes |       | No |       |
|-----|-------|----|-------|
| 14  | 66.7% | 7  | 33.3% |

*Item 3.4 Any Comment and here in almost all respondents commented that learners do not practice mathematics on their own from their homes and their number was 16 respondents. Five (5) of them commented that they wish that Mathematics would be made as a compulsory learning area from lower grades and parents should play a role in assisting their children.*

## DISCUSSION

### Section A

Item 2.1 showed that majority of educators teaching mathematics from all schools in the

**Table 5: Questions which have to be answered by educators**

|       |                                                                           | Yes | No | Yes % | No % |
|-------|---------------------------------------------------------------------------|-----|----|-------|------|
| 6.1   | Are you suitable in teaching mathematics?                                 | 20  | 1  | 95.2  | 4.8  |
| 6.2   | Is mathematics you major learning area?                                   | 20  | 1  | 95.2  | 4.8  |
| 6.3   | Do you think group discussions are important for learners in mathematics? | 15  | 6  | 71.4  | 28.6 |
| 6.4   | Do you think most learners need help in you class.                        | 13  | 8  | 61.9  | 38.1 |
| 6.5   | Do you have learners who need special help in you class?                  | 14  | 7  | 66.7  | 33.3 |
| 6.6   | Are you working with other mathematics educators in you school?           | 17  | 4  | 80.9  | 19.1 |
| 6.7   | Are you having enough mathematics resources at you school?                | 3   | 18 | 14.2  | 85.8 |
| 6.8   | Do you get enough assistance from learners parents?                       | 6   | 15 | 28.6  | 71.4 |
| Total |                                                                           | 21  |    |       |      |



study were males with 52.4 percent (n=11), whereas 47.6 percent (n=10) were females. This implied that males were more inclined to teach mathematics than female educators. Item 2.2 which asked about the age of responders, found that a high percentage of educators were of the age between 31- 40 and they acquired 38 percent (n=8), followed by those who are 41 and above making (n=6) 28.7 percent, and closely followed by those who are at the age between 20-25 years (n=4) 19 percent. Here the implication is that age presence of more matured educators teaching mathematics indicates that they are more settled in teaching the subject and yet learners still do not achieve levels expected especially when taught by educators who are supposed to have investigated the problems inherent in learners' mastery of mathematics.

Item 2.2 shows that most of pupil whose teaching mathematics are educators with 66.7 percent (n=14), followed by HoDs with 33.3 percent (n=7).

Item 2.3 of the Biographical Information of educators involved the Classification of schools according to Quintiles. In the responses given by responders, the schools in this study were indicated as belonging to quintiles 1, 2 and 3. The implication of the relationship of lower quintiles and the mastery mathematics teaching and learning is that teachers are relying from government/state resources provision and the record of the government/state provision of resources is well documented in that there is always complaints of late delivery and insufficient supply of resources. Also, this implies that the schools are not in positions of generating their own money reserves as a result of being in poor communities that struggle to meet most basic needs for teaching and learning.

Item 2.4 of the Section A which captured the positions held by educators in their schools, seven (7) were HoD's and the rest were 14 were educators. This Item should be seen together with Item 5 which discussed the qualifications of the educators and here most educators were found to be having degrees and few having diplomas while the HoD's were found to be having post-graduate qualifications. Implied herein is that while HoD's had higher qualifications (post-graduate) they were not in positions of influencing the performance of educators and learners in terms of improving grades in mathematics outcomes. HoD's are also educators involved in teaching and they do not have to be in offices but rather show the right and appropri-

ate ways of improving the performance of educators which will ultimately trickle down to learner's improved performance.

Section B discussed more job related questions and on Item 6.1 on whether educators saw themselves as suitable for teaching mathematics, here the majority (95.2%, n=20) of them responded that they were suitable for teaching the learning area and only 4.8 percent (1) regarded him/herself as not suitable. This implies that those that saw themselves as suitable were not aware that their suitability does not improve the performance of the learners. Also implicating themselves, the very same 95.2 percent of respondents regarded mathematics as their major learning area. On Item 6.3 were they were asked about the importance of group discussions, they responded that they found group discussion as important with 71.4 percent (n=15) of them as opposed by 28.6 percent, (n=6). Item 6.4 asked about the importance of assistance needed in classes by learners and they (61.9%) of them (n=13) said that they found it important while 38.1 percent (N=8) were against it. They said that it is needed because learners will not be sure whether they are correct or not in methods of solving problems. On Item 6.5 learners need special help in you class (n=14) 66.7 percent were positive while 33.3 percent (n=7) of them were not positive about the assistance learners should be afforded. Item 6.6 on whether educators are working with others in order to find better ways of teaching mathematics, 80.9 percent (n=17) indicated that against the 19.4 percent (n=4) who indicated that they do not work with other educators. This implied that most educators do want to find success stories from others in order to improve while few of them (n=4) were less impressed with working with others. On Item 6.7 on whether schools had adequate and enough mathematics resources at their schools, here a few of them 14.2 percent (n=3) replied that they had enough and adequate resources while the majority 85.8 percent (n=18) declined that they have sufficient and enough resources at their disposal. Herein implied is that most educators do not get adequate material support from the state. On Item 6.8 on whether educators do get support from their homes by parents, 28.6 percent (n=6) replied that get support from learner's parents while the majority of them making 71.4 percent (n=15) declined that they receive support from learner's parents. This implies educators are expecting to be supported by parents through parental support systems but they few of them get that.

Section C discussed topics which teachers find difficult to learners, and Financial Mathematics (n=14) making 66.7 percent of respondents found to be difficult with Geometry 61.9 percent (n=11) followed by Trigonometry rated by 52.4 percent (n=11) of educators finding it second while the least difficult topic was found to be Transformation (n=2) with 9.5 percent as well as Sequence and Series (n=5) made up of 23.8 percent of respondents.

On other Items of Section C were open-ended questions where educators elaborated on whether educators found mathematics as important, the problems they experience and the presence of the mathematics laboratory as well as what they can say about the learning area. Most educators indicated the need of mathematics laboratory. Others indicated the importance of mathematics and highlighted that there is more need of making mathematics a compulsory subject in lower grades.

### CONCLUSION

From the study the researcher came to conclusion that, the age of educators exposed that younger educators should be encouraged to teach mathematics otherwise the standards and desired performances of educators which are reflected by learner's levels in mastery of mathematics will keep on dwindling and going down or stagnate.

### RECOMMENDATIONS

Learners have to master mathematical concepts and have positive attitude towards the learning area. Parents should always be involved in the education of their learners. Mathematics language should be introduced and practiced from lower grades. Department of education should provide each school with mathematics laboratory and its resources and in-service training to all schools.

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