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# Lacking the Learner-centred Approach in Mathematics: A Curricular Paradigm

**Mutendwahothe Walter Lumadi**

*Department of Curriculum and Instructional Studies, University of South Africa, South Africa*
*E-mail: Lumadmw@unisa.ac.za*

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**ABSTRACT** Mathematics is fundamental to national prosperity in providing tools for understanding science, technology, engineering and economics. It is essential in public decision making and for participation in the knowledge economy. Mathematics equips learners with unique and powerful ways to describe, analyse and change the world. It can stimulate moments of pleasure and wonder for all learners when they solve a problem for the first time, discover a more elegant solution, or notice hidden connections. This study investigated a societal problem – the on-going poor performance in mathematics. The study described what is going on by means of statistical methods and reported in statistical language and hence, descriptive quantitative research paradigm infused with content analysis (cartoons) was adopted. The sample for the study comprised a total of ten underperforming (failing) secondary schools obtained by simple random sampling; 50 Grade 12 mathematics educators and 200 Grade 12 mathematics learners selected through stratified sampling technique.

## INTRODUCTION

The success or failure of any school curriculum is determined according to the school manager's vision. A school manager's role is a complex mix of leadership and administration, geared towards enabling and motivating school staff to provide the best possible opportunities for learner growth and achievement. School managers are exposed to a number of challenges, especially in their first year at a school, when they must function effectively in a new environment and assimilate quickly to a new culture. Further, they are usually expected to improve or at least maintain levels of learner achievement especially in gateway subjects such as mathematics and science. In their first-year their decisions and strategies are critically important and influence their performance, their success as a school leader, and the likelihood that they will remain at that school.

Mathematics is widely acknowledged as one of the cornerstones of future development and prosperity. Asmal (2005) classified mathematics as the priority of all priorities; as Gouba (2012: 2) stressed that, "Education should be started with mathematics, for it forms well-designed brains that are able to reason right. Mathematics is generally accepted as a gateway subject "enabling discipline" (Pandor 2011); former president Mbeki (2009), emphasised the centrality of mathematics as part of our human development strategy. It is imperative to note that mathematics is increasingly recognised as one of the most reliable indicators for measuring socioeconomic and geo-political development among nations. Zuma (2014: 3) is of the opinion that "Mathematics is the bedrock of science while science is the necessity for technological and industrial development" (Betiku 2011: 49). Contrasting to these views, the low mathematics pass rates at Grade 12 level are not only a source of frustrations and embarrassment for the learners concerned, but also reflect a low level return for substantial investment made by government, communities, and parents in the education of their children.

The education system takes the lion's share of resources, placing South Africa at or near the top of the international league in terms of proportion of national resources (GDP) devoted to educational spending. Since the transition to democracy, resources devoted to school education have increased considerably and large resource shifts have taken place to the poorer schools (Van der Berg and Burger 2010), yet outputs of successful matriculants or of those matriculating with university exemption are stagnating or declining. The former minister of finance, Manuel (2012) is of the opinion that, education is viewed as the central objective of broadening opportunity and fighting poverty. This budget prioritises school building, early childhood education, school books and educator remuneration. The education spending ac-

counts to R105.7-billion." Further, Manuel (2012) encapsulated that, Government's contribution to public education remains as the largest investment, because it is the key to reducing poverty and accelerating long-term economic growth. Govender (2010) remarks that the Minister of Finance reiterated; "education spending remains as the largest item of spending, giving meaning to our commitment as our number one priority". The total budget for education ... is R165.1-billion. Consequently, with about 5.3 % of gross domestic product and 20% of total state expenditure on education, South Africa has one of the highest rates of public investment in education in the world.

In addition, a number of programs and initiatives have been put in place: the South African National Department of Education in 2000, introduced a National Strategy for Mathematics, Science and Technology Education (now called the *DINALEDI* meaning *little stars* project); the North West Department of Education established Mathematics, Science and Technology Unit (MSTU); the Western Cape Education Department, launched the Khanya Project. The President, Zuma (2012) reiterated the non-negotiable; "Teachers should be in school, in class, on time, teaching, with no neglect of duty and abuse of Learners! The children should be in class, on time, learning, be respectful to their teachers and each other, and do their homework. Besides, the Minister of Basic Education, Motshekga, in 2010, launched the Action Plan to 2014: Towards the Realisation of Schooling 2025, to avoid ad hoc and fragmented interventions. (Report on the National Senior Certificate Examination Results 2010). Against all odds, the entire schooling system is characterised by low matriculation pass rates, especially in gateway subjects (mathematics, science and accounting) (Naidoo 2010; Coetzee 2011). *The Star* (8 January 2013) stresses that the standard of public education is not reflecting a corresponding correlation with the massive investment (money, programs and initiatives). The NSC examination of 2008 was the first based on the New Curriculum Statement (Curriculum 2005). In Table 1 an insight into the national pass rates of all the learning areas (mathematics statistics interpolated as it is the area of study) is given.

Table 1 depicts the first NSC examination achieved a national pass rate of 62.6% and national mathematics pass rate of 45.6 %. Commenting on the matric results of 2008, Pandor (2011) best described matric pass rates as pathetic (educationweb.co.za). In 2009, the national pass rate plummeted to 60.6% while the national mathematics pass rate increased by 0.4% to 46.0%. Govender (2010) pointed out that, "The 60.6% pass rate recorded for 2009 is a far cry from the 70.7 % achieved in 2004. The national matric pass rate of 60.6% which has been declining since 2004 is a national disgrace." Motshekga, Minister of Basic Education (2010) on announcing South Africa's 2009 National Senior Certificate Results, regretfully admitted that "the achievement was depressing, and added that, the matric results were an economic failure. A national pass rate of 67.8% was seen in 2010, a massive improvement of 7.2% from 2009.

**Table 1: National Senior Certificate Pass Rates: 2008 to 2010**

| *Year* | | *Total wrote* | *Total passed* | *Passed %* |
|---|---|---|---|---|
| *2008* | All subjects | 554 664 | 345 001 | 62.6 |
| | Maths | 298 821 | 136 503 | 45.6 |
| *2009* | All subjects | 580 527 | 351 829 | 60.6 |
| | Maths | 290 407 | 133 505 | 46 |
| *2010* | All subjects | 537 543 | 364 513 | 67.8 |
| | Maths | 263 034 | 124 749 | 47.4 |

By the same token (Table1), Pandor (2011) comments, "The number of learners sitting for Grade 12 mathematics declined from 298 821 in 2008 to 290 407 in 2009 and 263 034 in 2010." Conclusively, Valley (2010) criticised the 30% and 40% benchmarks for passes feeling these were too low. He points out that, "We are setting our sights too low. There is nothing to celebrate. Our schooling system is failing our young people and we need to revive it." (http// www.educationweb.co.za)

## METHODOLOGY

The present research study followed quantitative survey research and content analysis methodologies. Descriptive quantitative survey research was seen as ideal because it is concerned with the present, although, it often considers past events and influences as they relate to current conditions (Cohen and Manion 2012: 67). The relationship of one set of facts to other mathematical procedures is followed to aggregate and summarise the evidence. Standardised

measurement procedures are used to assign numbers to observations, and statistical procedures are used to analyse quantitative data (Durrheim 2012). Further, textual analysis was adopted as it uses a sample of images rather than people, a technique for making inferences by objectively and systematically identifying specified characteristics of antecedents of communication and texts are studied as to authorship, authenticity or meaning. In addition, the results of content analysis allow researchers to identify, as well as quantify, specific ideas, concepts, and their associated patterns, and trends of ideas that occur within a specific group or over time (Krippendorf 2013; Weber 2013). More importantly, the results of content analysis are numbers and percentages and further, uncover causes and promote awareness.

### Participants

In the present research, the population was 138 Grade 12 mathematics teachers and 1153 Grade 12 mathematics learners at 23 underperforming (failing) secondary schools in the Gauteng East district. The sampling of participants of the study began with simple random sampling of ten underperforming secondary schools. Stratified random sampling was applied to obtain 200 learners (136 females and 64 males) and 50 teachers (17 females and 33 males). The sample responded to a respondent-centred questionnaire with closed and open questions or statements. As for content analysis, the corpus (the body of information) was daily and weekly newspapers. The sample of the study was images on the cartoon page, educational cartoons (Weber 2013).

## RESULTS AND DISCUSSION

The rationale of the study was to explore factors that cause low pass rates in mathematics at Grade 12 level in public high schools, all participants were learners and educators. Five factors (Educational policies - Learning areas; Promotion policy and Educator's and Learners' behaviour - School or classroom discipline; Drugs and alcohol abuse; and Learner pregnancy) resulting from questionnaires' responses and analysis are presented here.

The first problem is stated as follows; To what extent will educational policies contribute to Grade 12 learners' mathematics pass rate?

### Learning Areas

To confirm responses from the questionnaires administered about some educational policies in place. In Table 2, it was revealed that the low pass rates in mathematics at Grade 12 level were largely due to the existing educational policies. To recap the overall responses, out of 250 respondents, 216 respondents (88%) indicated that low pass rates in mathematics at Grade 12 level were mainly due to the number of learning areas prescribed by NCS (a learner must do at least seven subjects at FET). On the other hand, 31 participants (12%) disagreed, of which 21 participants (08%) disagreed and 10 participants (04%) strongly disagreed. According to questionnaire responses, one may suggest the introduction of specialisation from Grade 10 and perhaps a minimum of three learning areas would enhance good pass rates not only in mathematics, but also in other gateway subjects.

**Table 2: Findings regarding the first problem**

| | *A* | *%* | *B* | *%* |
|---|---|---|---|---|
| Learning areas are too many | 216 | 88 | 31 | 12 |
| Condoned mathematics learners | 108 | 88 | 15 | 12 |

### Promotion Policies

With regard to Promotion Policy in Table 2, 174 respondents (69%) agreed or strongly agreed with the assertion that "Condoned learners" contribute to low pass rates in mathematics at Grade 12 level in public high schools in the Gauteng East District. The 69% was made up of 58 respondents (23%) who strongly agreed and a further 116 respondents (46%) who agreed. Contrarily, 76 respondents (31%) disagreed; 46 respondents (18%) disagreed and 21 respondents (13%) strongly disagreed. Condoning (assisting learners to reach matric) to a greater extent, contributes to a low matric pass rate in mathematics (as mostly learners are condoned in mathematics up to Grade 12 level). Consequently, grade repetition (learners repeating a failed grade at most three times) contributes to a large number of over-age learners with spill-over effects of many learner pregnancies. Indiscriminate promotion from lower classes in schools significantly leads to poor matric results partic-

ularly in mathematics. Condonation, according to National Protocol for Assessment Grades 1-12, is the relaxation of promotion requirements as contemplated in paragraph 29(1) (b) of the policy document, pertaining to the programme and promotion requirements of the National Curriculum statement.

The following question was posed. How will the behaviour of educators and learners affect the overall Grade 12 mathematics pass rates?

**School (Classroom) Discipline**

Evidently exhibited in Table 3, 60 participants (24%) strongly agreed that "lack of discipline among educators and learners" was a contributing factor to low pass rates in mathematics at Grade 12 level in public high schools in the Gauteng East District. In addition, 93 participants (37%) agreed, hence 61% of the respondents were in agreement with the assertion. On the other hand, 97 participants (39%) disagreed, of which 59 participants (24%) disagreed and 38 participants (15%) strongly disagreed. Findings from the present study were, thus, consistent with Siwela's argument in the Citizen Newspaper (2014). Siwela (2014) rightly captures morning events at a school with the following notion; The "teacher", a role model, is always... late and subsequently, learners are also coming late to school.

**Table 3: Findings with regard to the second problem**

| | *A* | *%* | *B* | *%* |
|---|---|---|---|---|
| Lack of discipline among educators and learners | 153 | 97 | 61 | 39 |

It is worth noting here that lack of discipline in many schools stems from the 1970s where Learners were given the power by revolutionary forces to make the country ungovernable. Learners to this day, still think they can run the school. In the 1980s there was a policy "Pass one, pass all" and in those circumstances it was almost impossible to maintain standards.

As displayed in Table 4, negative behaviour (drugs and alcohol abuse) of educators and learners towards teaching and learning was statistically significant in contributing to low pass rates in mathematics at Grade 12 level. The results showed more than half of the respondents (62% of the respondents) agreed that negative behaviour of both educators and learners was one of the main factors causing low pass rates in mathematics. Yalo (2013) documented negative influences on education of many school goers. Learners' drinking attracts much attention in the press and hence, Yalo rightly shows the Class of 2011 concentrating on drugs, gambling, smoking and violence instead of doing homework and school-based assessments.

**Table 4: Behaviour of educators and learners**

| | *A* | *%* | *B* | *%* |
|---|---|---|---|---|
| Drugs and alcohol abuse | 154 | 96 | 62 | 38 |

The findings are in line with the United Nations World Drug Report (2009). The recent United Nations World Drug Report has named South Africa as one of the world's drug capitals. At times, experts have expressed concern that drug abuse is epidemic in South African schools where the age of drug users has dropped from teens to between nine and ten. In addition, the consumption of alcoholic beverages has a very long history in South Africa dating back to ancient times.

As with the results in Table 5, 70 respondents (28%) strongly agreed (SA) that "learner pregnancy" was a contributory factor to low pass rates in mathematics at Grade 12 level in public high schools in the Gauteng East District. In addition, 96 respondents (38%) agreed (A) to the assertion. In addition, 84 respondents (33%) disagreed (D) of which, 51 respondents (20%) disagreed and 33 respondents (14%) strongly disagreed (SD). Teenage pregnancy has emerged as one of the many challenges facing schools. Petje (2009) in the introduction of Circular 53/2000 highlights teenage pregnancy statistics in South Africa, for instance,100 000 legal abortions have been carried out

**Table 5: Learner pregnancy**

| | *SA* | *%* | *A* | *%* | *SD* | *%* | *D* | *%* |
|---|---|---|---|---|---|---|---|---|
| Pregnancy contribute to low pass rate | 70 | 28% | 96 | 38% | 84 | 20% | 51 | 14% |

since the passing of the choice on Termination of Pregnancy Act 92 of 1996. Nationally, a similar pattern holds, as Yalo's cartoon shows. Yalo (22 February 2013), reacted to the release of statistics depicting a frighteningly high instance of schoolgirl pregnancies.

The findings are further supported by statuary instruments. According to the South African Constitution, 1996 (Act 108 of 1996) and South African Schools Act, Act number 84 of 1996, a pregnant learner may remove herself from school and be allowed to continue with her schooling after the delivery of her baby. In terms of this Act (SASA), a pregnant learner may not be expelled from school on the basis of her pregnancy, nor may she be refused admission to school on the basis that she is or was pregnant. Motshekga (2014) concurred with the findings by pointing out that, "Pregnancies in schools are still through the roof."

## CONCLUSION

The school managers who participated in case studies tended to name a few strategies, which they called "big rocks," on which they focused their time and effort. Most common were promoting data use, conducting classroom observations, building culture and relationships within the school community, forming leadership teams, and promoting teacher professional development. The outdated Outcomes-Based Education has taught learners that they can pass with minimum mathematics knowledge. The Revised National Curriculum Statement which was approved on 15 April 2002 and implemented in 2004, started with Grade R. It provided guidelines on what should be taught from Grades R to 9. It specified the required outcomes (or what is expected of learners in each grade and learning area) and the standards used to assess whether learners have achieved these outcomes. The National Curriculum Statement Grades 10-12 (General) laid a foundation for the achievement of these goals by stipulating Learning Outcomes and Assessment Standards, and by spelling out the key principles and values that underpin the curriculum. OBE develops memory but does nothing to develop long-term knowledge and skills. According to the findings of the present study, learners performed poorly largely due to too many learning areas on offer; lack of discipline (both educators and learners); promotion policies; drug and alcohol abuse and learner pregnancy. To improve its implementation, the National Curriculum Statement was amended, with the amendments coming into effect in January 2012. A single comprehensive National Curriculum and Assessment Policy Statement was developed for each subject (including mathematics) to replace the old Subject Statements, Learning Program Guidelines and Subject Assessment Guidelines in Grades R-12. The amended National Curriculum and Assessment Policy Statements (January 2012) replaced the National Curriculum Statements Grades R-9 (2002) and the National Curriculum Statements Grades 10-12 (2004).

## RECOMMENDATIONS

On the basis of the findings reached in the study, the following recommendations were made:

- No teacher education policy framework: Implement training of the educator programme (Human resource development training programmes);
- Approaches to managing absenteeism should be devised in a holistic way, to take account of the broader problems that contribute to absenteeism;
- Department to pronounce clear guidelines about classroom management and discipline strategies;
- A national policy on teenage pregnancy with clear guidelines that safeguard rights to education was needed.

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