FACTORS ATTRIBUTED TO POOR PERFORMANCE IN GRADE 9 MATHEMATICS LEARNERS SECONDARY ANALYSIS OF ANNUAL NATIONAL ASSESSMENTS (ANA)

Yeyisani Makhubele
Faculty of Education
University of Johannesburg
South Africa
Email: yeyisani@gmail.com

Kakoma Luneta
Faculty of Education
University of Johannesburg
South Africa
Email: kluneta@uj.ac.za

Abstract–This article is about the factors associated with learners' poor performance in grade 9 mathematics Annual National Assessments (ANA). The study used a qualitative research approach to illuminate factors associated with this problem. Participants were purposefully selected from four schools with poor pass rates. Data was generated from different sources for triangulation, namely questionnaires, interviews and document analysis. After the analysis, coding and categorizing of data, the following factors were identified as the main causes of learners' poor performance answering: content related factors - these are factors that relate to the mathematics children learn, how they learn it and how it is disseminated to them; didactic factors - these are factors that are due to the instructional approaches and how these enhance or inhibit learners' mathematical knowledge acquisition; systemic factors - these are factors that the educations system impose on the learner and they include the school environment, the administration and the general educational support as well as the social factors- which are related to the child home and community environment and how that impacts on the child's learning of mathematics.

Keywords: ANA, Didactic factors, Systemic factors, Social factors, Content related factors.

INTRODUCTION AND BACKGROUND

The Department of Basic Education (DBE) has identified ANA as a vehicle for improving the quality of education in the lower grades. Previously, external assessments were done only in grade 12. The DBE has now shifted the focus on the lower grades. In this regard, ANA is used as a critical measure for monitoring progress in learner achievement in these grades. The data on learner achievement in ANA is useful for informing education policies, designing and implementing intervention programs aimed at improving classroom learning and teaching, identifying and supporting learners with learning barriers, providing effective methodological support to schools and the provision of training and professional development opportunities for underperforming schools and teachers (DBE, 2013). Both the 2012 and 2013 ANA results show that South African learners are not performing well in Grade 9 mathematics (see table 1). Achievement in mathematics declined across the grades with progressively steeper declines from Grade 6 to Grade 9. According to DBE (2013), grade 9 learners "demonstrated a fairly limited repertoire of necessary basic skills and knowledge, a signal warranting particular attention, given that this is a critical transition grade into the Further Education and Training (FET) Band of the school system". This is alluded to by Spaull (2013) whose report reveal that 76 per cent of Grade nine learners in 2011 still had not acquired a basic understanding about whole numbers, decimals, operations or basic graphs.

Table 1: National average percentage marks for mathematics in 2012 and 2013 (DBE, 2013).

GRADE	MATHEMATICS 2012	MATHEMATICS 2013
1	68	60
2	57	59
3	41	53
4	37	37
5	30	33
6	27	39
9	13	14

The average % of all the provinces is shockingly below 17% (see table 2). Less than 4% of the learners in all the provinces (except WC at 6.8%) achieved more than the acceptable achievement mark of 50%.

Table 2: Achievement in Grade 9 mathematics by province in 2012 and 2013 (DBE, 2013).

PROVINCE	AVERAGE MARK (%)			ACCEPTABLE ACHIEVEMENT (≥ 50%)		
	2012	2013	verification	2012	2013	verification
EC	14.6	15.8	12.9	2.6	3.3	1.2
FS	14	15.3	14.8	3.1	4.1	2.2
GP	14.7	15.9	14.6	3.7	5.2	3.0
KZN	12	14.4	12.2	1.9	3.4	1.8
LP	8.5	9	10.1	0.5	0.9	0.5
MP	11.9	13.7	13.9	1	1.8	1.6
NC	13.2	12.6	12.9	2	2.4	2.5
NW	11.2	13.3	12.7	1.4	2.3	1.4
WC	16.7	17	16.5	5	7.2	6.8
National	**12.7**	**13.9**	**13.0**	**2.3**	**3.4**	**2.1**

The results also paint a gloomy picture in terms of the levels. Learner achievement in South Africa is expressed in terms of seven levels as shown below:

Table 3: Seven key Levels of achievement, (DBE, 2012).

RATING CODE	PERCENTAGE	DESCRIPTOR
LEVEL 1	0–29	Not achieved
LEVEL 2	30–39	Elementary achievement
LEVEL 3	40–49	Moderate achievement
LEVEL 4	50–59	Adequate achievement
LEVEL 5	60–69	Substantial achievement
LEVEL 6	70–79	Meritorious achievement
LEVEL 7	**80–100**	Outstanding achievement

About 88% of the learners performed at the not achieved level in Grade 9 Mathematics (see table 4 below). About 2% of learners performed at high achievement levels. This is a worrying trend.

Table 4: Percentage of grade 9 learners in achievement levels in Mathematics by province (DBE, 2013).

PROVINCE	L1	L2	L3	L4	L5	L6	L7
EC	84.9	7.5	4.3	1.9	0.8	0.4	0.2
FS	86.9	5.6	3.4	1.9	1.1	0.6	0.5
GP	84.8	6.1	3.9	2.3	1.4	0.9	0.6
KZ	87.3	5.8	3.5	1.9	0.9	0.4	0.2
LP	95.9	2.2	1.1	0.5	0.2	0.1	0.1
MP	91.1	4.6	2.5	1.0	0.4	0.2	0.2
NC	91.8	3.9	2.0	1.1	0.7	0.4	0.2
NW	90.5	4.7	2.5	1.1	0.6	0.4	0.3
WC	83.1	5.7	3.9	2.8	1.9	1.3	1.2
National	**88.4**	**5.1**	**3.0**	**1.6**	**0.9**	**0.5**	**0.4**

THEORETICAL FRAMEWORK

This research report is based on the theory of constructivism. Llewellyn (2005) describes constructivism as a philosophy about how an individual learns, one in which the learner is embedded in active engagement and is constantly constructing and reconstructing knowledge. In constructivism, the responsibility for learning therefore lies with the learner. Emphasis then is placed on the learner being actively involved in the learning process.

AMESA compiled a report on the standard of the 2013 grade 9 ANA question paper following a request by the DBE for an independent opinion. The report indicates that the question paper presented a sound spread of content areas as required by the NCS (see table 5).

Table 5: Content area coverage in 2013 on ANA grade 9 Mathematics exam (AMESA, 2013).

Content area	Suggested %	Actual
Numbers, Operations and Relationships	15%	13%
Patterns, Functions and Algebra	35%	35%
Space and Shape	30%	19%
Measurement	10%	14%
Data Handling	10%	19%
TOTAL	**100%**	**100%**

Although there was a minimal deviation in terms of the questions that were set, AMESA (2013) reports that the paper was of a good standard and tested the knowledge and skills which a Grade 9 mathematics learner should have. It was a well- balanced paper, catering for a wide range of ability levels**.** The paper was generally in keeping with the Grade 9 ANA framework in terms of cognitive and difficulty levels; and the questions were well thought provoking, formulated clearly and unambiguously. According to AMESA, second language learners would have been able to understand most terms/concepts. The committee was of the opinion that there was adequate time allowed for the question paper; and that learners had enough time to complete the question paper (AMESA, 2013).

Based on the criteria (content coverage, cognitive level balance, language and time) of its analysis, the committee concluded that the paper was set at an appropriate, acceptable standard and must be regarded as fair. Learners who were taught well and worked hard should have had little difficulty in solving most of the problems in the paper.

If the standard was fair, the question then is why the learners perform so dismally. The poor performance of learners countrywide can therefore not be attributed to a difficulty paper set beyond the scope of the learners. The interest in this paper is to seek possible reasons for poor performance by learners. Of concern is the fact that the learning deficits that learners acquire in this grade will grow over time to the extent that they become insurmountable and preclude them from following the curriculum at higher grades, especially in subjects like mathematics and science. According to Spaull (2013), all of the available evidence suggests that many South African children are acquiring debilitating learning deficits early on in their schooling careers and that this is the root cause of underperformance in later years. Poor mathematics results at the primary and secondary level in South Africa severely limit the youth's capacity to exploit further training opportunities. Intervening early to prevent, diagnose and correct these learning deficits is the only appropriate response. It is for this reason that this study was undertaken.

This study aims to investigate the factors associated with learners' poor performance in grade 9 mathematics ANA, given the strategic importance of Mathematics for a world that has a technological slant and the critical transition that Grade 9 provides into FET Band. The study addressed the following research questions: *What are some of the factors that attribute to South African grade 9 learners' low performance in the Annual National Assessment exanimation?*

RESEARCH DESIGN AND METHODOLOGY

The study used a qualitative research approach within an interpretive paradigm to investigate the factors associated with learners' poor performance in grade 9 mathematics ANA. Data which were selected were on the basis of learners' lowest pass rates. The data collected was interpreted in the context of the research question, thus locating the study in the interpretative domain. The sample consisted of 40 learners (10 from each school) together with their respective mathematics teachers. The learners were randomly selected in each school. Data was generated from a combination of sources to allow for triangulation. These sources ranged from interviews, document analysis and questionnaires.

With permission from the Department of Education, the researchers contacted the principals of the schools to access the grade 9 ANA Mathematics results. Districts, provincial, and national results were accessed from the internet and regional office. Permission was also sought to interview and

administer questionnaires to both teachers and learners. For ethical reasons, the schools were coded S1 to S4, teachers T1 to T4, and learners L1 to L40. The limitation of this research report is that the sample used was rather small and therefore the results may not be taken as a true representative of the South African schools as a whole.

FINDINGS AND DISCUSSION

Interpretive descriptive analysis method was used in the analysis of data (Luneta, 2011). The researchers provided descriptions of the learners' and teachers' responses to questionnaires and interviews. The responses were then categorised according to the emerging themes and patterns based on the causes of the learners' difficulties encountered when responding to ANA questions. Document analysis on the work given to learners was also done. The causal factors were categorized in terms of categories, namely; content related factors (C1), didactical factors (C2), systemic factors (C3) and social based factors (C4).

Table 6: Category of causal factors

Category	Type	Description
C1	Content related factors	Factors related to the content taught to learners.
C2	Didactical factors	School based factors as a result of teaching and learning methods or strategies
C3	Systemic factors	Factors associated with policy
C4	Social based factors	Factors associated with society

Content related factors:

This relates to all factors related to the mathematical content taught to learners. This also includes the pedagogic content knowledge of teachers, which is how well a teacher understands common mistakes that learners make and how to correct them as well as the teacher's capacity to teach the subject matter.

This study established that learners' poor performance may be due to the quantity and quality of mathematical content taught to learners. The department provide schools with annual teaching plans and pace setters (wok programmes) to guide teaches in terms of when and what should be taught as well as when, how and what to assess. In an ideal teaching learning situation, the teachers' preparations, teachers' files, and learners' written work give an evidence of how much content knowledge was taught. Unfortunately there were no lesson preparations in the four schools where this research was conducted. Teachers had policy documents which were in their files but not used accordingly, for example pace setters were not used for lesson preparations and presentations. Without lesson preparations and not using pace setters, it was therefore not easy to determine when and how much was taught. The researcher solely depended on learners' books to analyse how much content was learned during the first term of 2014. The table below show content topics to be taught and the allocated time for the first term in grade 9.

Table 7: Topics and allocated time to be taught during the first term in grade 9 mathematics (DBE, 2011b, p. 37).

Term 1	
Topic	**Time**
Whole numbers	4,5 hours
Integers	4,5 hours
Common fractions	4,5 hours
Decimal fractions	4,5 hours
Exponents	5 hours
Numeric and geometric patterns	4,5 hours
Functions and relationships	4 hours
Algebraic expressions	4,5 hours
Algebraic equations	4 hours
Revision/Assessment	5 hours
TOTAL: 45 hours	

An analysis of whether these content topics were taught was done using learners' books as there were no teacher preparations.

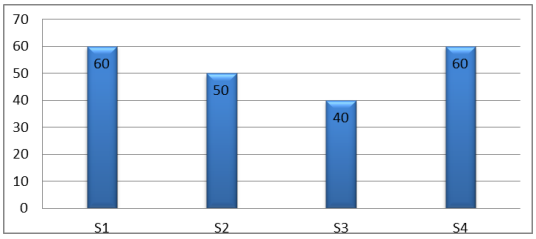

Figure: Schools' mathematics content coverage for term 1 in percentages

The figure shows that S1 and S4 managed to complete about 60% of the topics they were supposed to teach. S2 completed about 50% while S3 completed about 40 %. The number of mathematics lessons given by teachers was therefore less than the official number they were expected to teach. This indicates that time on task is a problem. In all these schools, revision was not done although there was provision of this in the term plan. A quarterly assessment however was done with question papers being set by the district. These assessments must have given learners problems considering the content coverage in term 1. This pathetic state of teaching is aggravated by not using period attendance registers, resulting in no evidence of number periods attended per week and quarter. The gleaning of learners' books therefore gave an evidence of low content coverage (see figure 1). This means low numbers of periods were taught which in turn compromised content coverage, content emphasis and content exposure. Content coverage refers to the extent to which mathematics topics were covered or taught in the classes (Carnoy et al., 2011). Content emphasis refers to the relative amount of time each class spent on each of the various topics that relate to the content. Content exposure refers to the overall amount of time students spent engaged in doing mathematics. Interviews with teachers revealed the following factors which contributed to low content coverage: departmental meetings, time provision in the timetable, school and cluster meetings, marking learners' work, corrections, and the need to address gaps.

It was therefore not surprising that most of the learners interviewed indicated that the questions on ANA exams were difficult. This was affected by the number of periods taught which affected content coverage. Three of the teachers interviewed blamed the previous grades for not teaching enough content. They complained that they had to spend valuable time preparing learners with mental mathematics and some sections which should have been mastered in their previous grades. If learners had not mastered basic skills and the content taught in the previous grades, then the new content will be difficult to master.

Some of the learners indicated that not enough class activities were given to them and the activities were simpler compared to the exam questions. Some teachers admitted giving simpler tasks to learners. The reason was that it was far much easier to mark them and be able to give the maximum number of tasks required per week as required by policy. This also shows that the cognitive demands made by teachers of learners in the classrooms are low. According to Carnoy et al. (2011), cognitive demand refers to the "cognitive or conceptual level at which the learners in the class are engaged with the mathematic content covered". When assessing learners on a daily basis, questions should be selected from all the four cognitive levels, namely knowledge, routine procedures, complex procedures and problem solving. The four cognitive levels used to guide all assessment tasks is based on those suggested in the TIMSS study of 1999 (DBE, 2011a). Each balanced test written by learners should include questions from all these cognitive levels. A balanced test should have 20% of knowledge questions (questions which needs straight recall or one step), 45 % of routine procedures questions(questions which requires learners to perform well known procedures , simple applications and calculations which might involve many steps), 25 % of complex procedures questions (questions with problems that involve complex calculations and/or higher order reasoning which requires

conceptual understanding), and 10 % of problem solving questions (questions that need higher order understanding and processes). Concentrating only on knowledge based questions is failing the learners because an examination includes questions from all the four cognitive levels.

Didactical Factors

This refers to all factors within the school context, including factors as a result of incorrect teaching and learning methods or strategies. A report by the OECD (2005, p. 2) concludes that, second only to learner background factors, "factors to do with teachers and teaching are the most important influences on pupil learning". This is alluded to by Barber and Mourshed (2007, p. 12) who argue that "the main driver of the variation in pupil learning at school is the quality of the teachers".

Teachers complained about time provision in the time table. According to Taylor (2007) strong evidence exists showing that adherence to basic educational policies and processes can have an impact on good teaching and learning**.** Taylor (2007) further argues that issues around the maximisation of contact time with learners in class, the presence of both learners and teachers at school and in class, makes a positive impact on educational. Analyses of the timetables of the four schools reveal a minimal usage of contact time for teaching and learning as per policy. These schools use a 35 minute period system with one double period per week, resulting in mathematics being allocated 210 minutes per week. According to DBE (2011b, p. 8) the instructional time in the Senior Phase for mathematics is 4, 5 hours which is 270 minutes (see table 7). This means about an hour of mathematics teaching is lost per week. This is a lot of time lost per term and per year. This results in a chronic and systemic reduction of teaching and learning in class. Unfortunately this study was unable to determine how much time was spent on teaching mathematics as there were no period attendance registers signed by educators. If the amount of work given to learners is used as a yardstick of the time spent on teaching, coupled with the allocated time per week, it is evident that not enough time as required by policy is spent on teaching and learning.

Learners complained that often teachers are fast. Interviews reveal that this pace was a result of teachers' anxiety to keep pace with the work schedule and finish the syllabus. This fast pace makes leaners not to understand mathematics. Learners then become anxious and develop negative attitude towards mathematics. According to Khatoon and Mahmood (2010), negative attitude towards mathematics may have its roots in teaching and teachers, with maths anxious teachers resulting in maths anxious learners at times. Such teaching is characterised by an over-reliance on traditional instructional activities such as drills, memorization, textbook method teaching, one correct method of solving a problem, and concentrating more on basic skills rather than concepts (Khatoon & Mahmood, 2010)**.**

Teachers complained about lack of resources. Learners had no calculators which made it difficult to perform and solve some mathematical problems. According to Taylor and Reddi (2013), lack of resources like models, pictures, drawings, graphics, calculators and charts is acontributory factor to learners' negative artitude towards mathematics. Mathematics classrooms should have a mathematics feeling and touch. Learners should see mathematics around them. The classroom is also a place where positive or negative attitude towards mathematics can develop and flourish.

Performance was affected by ineffective leadership. Mathematics HOD's never call meetings with teachers and learners' work is neither supervised nor moderated. Meetings facilitate communication and the flow of important information. Teachers believe regular meetings may assist them with curriculum issues, specific questions around subject content, improvement of their style of teaching. It seems HOD's lack the technical capacity to manage the department. Teachers articulated a need for effective assistance, guidance and mentoring in most aspects of teaching, but specifically around issues of lesson planning and assessments. This was supposed to be provided by their HOD's who allegedly are failing them.

Another contentious issue which was discovered when analyzing documents is that workbooks provided were not used. Teachers were only using activities which are in the textbooks. Exemplar

question papers provided were also not used. This seemed problematic because exemplars and workbooks have questions on the four cognitive levels. Failing to use these resources resulted in teachers giving learners only simpler classwork activities whereas in the examinations learners faced challenging questions.

Systemic factors

This relates to all factors associated with policy. Mathematics as a subject has its own policy which relates to the assessments, number of periods to be taught and other relevant aspects related to it. The NDP report highlights a number of institutional and systemic factors such as the management of the education system, the competence and capacity of school principals and heads of departments, teacher performance and accountability, as factors preventing progress in South Africa's schooling system (NPC, 2012, p. 38).

Teachers felt the system is putting too much pressure on them in terms of the quantity of the work to be taught and the quantity of tasks to be given. They complain that the tasks to be given per week are too many considering that corrections and teaching have to take place. Teachers are expected to give at least four tasks per week. This proves to be challenging because they are teaching other subjects with overcrowded classes which also have tasks to be controlled as well.

Teachers complain about the syllabus that is always changing. They complain about teaching new content which they themselves do not know. Teaching a content which a teacher does not understand is a recipe for failure as alluded to by Taylor and Taylor (2013) who posited that learners will not do well in mathematics when their teachers who were supposed to guide did not know the subject themselves. Teachers indicated challenges in topics such as transformations, measurement as well as shape and space. Although workshops are sometimes conducted, there is not enough time to engage with the content. Usually workshops are conducted after school hours for about 2 hours or more to which teachers claimed that they are usually too tired with the day's work. Some of the workshops are conducted during holidays with many of them having gone back home as they are from other provinces like Limpopo. Because of the lack of adequate training, teachers may not adequately discuss mathematical problems with learners as has been alluded to in other studies.

The teachers interviewed reveal that the policy which states that a child may only be held back once per educational phase is also contributing to learners' poor performance. The South African Admission Policy for Ordinary Public Schools (1998) limits grade repetition to a maximum of one year per school phase (DBE, 2008). This forces schools to promote learners to the next grade without them having mastered the necessary mathematics knowledge and competencies as demanded by the curriculum. Teachers are therefore forced to promote mediocrity by this policy. While there is a cap on the number of repetitions allowed in the schooling system, the policy cautions that this limit should not be construed as promoting automatic promotion.

The problem is also number of Mathematics Curriculum Implementers (CI's) visiting the schools. The teachers revealed that CI's are not coming to their schools for support. Upon investigations, it was found that only four CI's are serving the whole region with 348 schools, an average of 87 schools per CI. This situation is not conducive for effective monitoring.

Social based factors

Learners are social beings. They are born and live within a particular society. Sometimes society has its own views and attitude towards mathematics. One of the most views of society towards mathematics is that it is a difficult subject **(**Khatoon & Mahmood, 2010).

Learners in this study also attributed their failure to the fact that mathematics is naturally difficult, and therefore there was nothing they could do to pass. This social factor is a mathematical myth which may induce or reinforce negative attitude in some learners.

This study also established that learners do not receive assistance from parents or family members. It is impossible for learners at the school where this research was conducted to receive parental

support in terms of mathematics education. This is because most parents are illiterate. Even teachers complained that learners' performance in tasks like projects, assignments and investigations is poor because of parental support at home. Mji and Makgato (2006) propose service learning to close this gap. Service learning involves learners assisting other learners while meeting their own learning objectives. In mathematics, this would involve a learner assisting another learner with math skills. With service learning, there are three key elements to a successful program: exposure provides the learner with exposure to another learner struggling to learn the same skills, the experience needs to meet a community need for it to be valuable to the learner, and the learner also need to have the time to provide reflection. Mji and Makgato (2006) found that learners who participate in a service learning experience have a great motivation toward their own subject involvement.

Another social factor is the ridicule of learners who get wrong answers by their peers in class. This is alluded to by Khatoon and Mahmood (2010) who argued that a learner may develop a strong dislike for a certain subject where other learners habitually ridicule him or her in front of his/her peers. The classroom should be a place where learners learn without fear of making mistakes. Mistakes should be viewed as a vehicle for meaningful learn.

CONCLUSION

This study has established that learners' poor performance in grade 9 mathematics ANA can be attributed to the didactic obstacles they encountered in their previous or present grade, to systemic problems, to social problems or to content related problems. The dismal poor performance of grade 9 Mathematics in ANA is therefore a symptomatic of state of mathematics teaching in the senior phase (grades 7 – 9) or perhaps even in the junior phases in South Africa. Over the years, the DBE has paid more attention to the FET Band, especially grade 12, and neglecting other phases. It is possible that this neglect has also contributed to this poor state of teaching and learning of mathematics in grade 9. Immediate attention should be given to all the junior phases. Maximum energy should be channelled to these phases. Interestingly, during the apartheid era, external examinations, with certificates being awarded, were written in standard 5 (now called grade 7) and form 3 (now called grade 10). Perhaps it is now time for the DBE to reintroduce this assessment and certification policy for it will encourage both learners and teachers to work very hard.

From the findings in the previous section of this study, the following recommendations are made:

RECOMMENDED TIPS FOR THE DBE

From the findings of this study, it is clear that there is the need to improve the pedagogic content knowledge of teachers. The DBE should therefore 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 meaningful. According to Spaull (2013) a large proportion of South African teachers still have below-basic content knowledge in the subjects that they teach – largely as a result of the ineffectiveness of in-service teacher training initiatives. A system of identifying which teachers need what help is urgently required. The DBE should first aim to ensure that every teacher in the system has the basic content knowledge required to cover the curriculum that they currently teach. The DBE should then implement a nation-wide system of diagnostic teacher testing and capacitating for mathematics teachers. Teachers should be reassured that these tests are primarily for diagnostic rather than punitive purposes. They should be developmental in nature with the ultimate aim of not vilifying and demeaning teachers and the teaching profession, but to increase the capacity and dignity of teachers.

There should be an increase in the managerial, administrative and technical capacity of the districts bureaucracies. CI's should be based at circuit level instead of district levels. This will make it easier to establish an efficient monitoring of curriculum coverage. The result will be an improvement in the quantity and quality of assessment tasks given to learners. Monitoring will ensure making optimal use of teaching and learning time because of regular class attendance by teachers and learners.

The DBE should help improve the competence and capacity of mathematical HOD's. HOD's should be appointed purely on merit. They should always be held accountable for their schools low performance. According to RESEP and Oxford Policy Management (2012, p. 37) most educational systems appears to suffer from both a lack of top-down oversight and a lack of bottom-up accountability, which means that there is little consequence for non-performance and therefore little emphasis on results. There should therefore reinforcement of the HOD's subjects' supervision.

The department supplies schools with exemplars and support materials like assessment guidelines and annual teaching programme. Through the CI's with the assistance of the principals and the HOD's, monitoring should be done to ensure that these documents are used. Strict monitoring should be done to ensure that teachers are teaching the right content and asking appropriate questions in terms of all taxonomy levels.

The department also supplies schools with workbooks. Workbooks are viewed as an important intervention strategy for improving performance of learners in national and international assessments of literacy and numeracy. According to DBE (2013) report, the purpose of the workbooks is to "provide good quality activities; ensure that learners are given adequate opportunities to consolidate their skills through written responses; guiding teachers to improve their teaching; provide a variety of activities to reinforce mathematical concepts and skills, literacy/ language skills; help teachers to monitor learner performance in key activities; and prepare learners for the formats used in various standardized assessments". This study found that some schools are not using these work books. The DBE, through the CI's, the principals and their HOD's should ensure that these workbooks are used effectively and efficiently.

The CI's should conduct a comprehensive audit of the identified underperforming schools and determine the causes of poor performance. They should facilitate, through the assistance of the mathematics HOD's, the setting of annual targets, improvement plans and intervention strategies. They should improve teacher supervision by doing quarterly inspection with quarterly reports being compiled by schools. CI's should monitor compliance with CAPS. They should ensure that there is proper timetabling and utilization. They should also ensure that all schools have time tables that comply with curriculum policy and that mathematics is afforded maximum minutes as per policy.

Lastly, the DBE should consider reducing the teacher - learner ratio and the number of subject a teacher teaches. This will make provision for the employment of extra educators to reduce the burden of teaching many subjects and learners, as well as of controlling many tasks. Class sizes impact on learner performance. Small classes allow teachers to give more attention to individual learners. In South Africa, for every teacher there are 33 learners, compared to Botswana where the ratio is 1:22, which is one of the lowest teacher/learner ratios in the world (DBE, 2008).

RECOMMENDED TIPS FOR TEACHERS

The core business of schools is learning and teaching, and the core task of principals is to ensure their school ethos is conducive to these priorities. Principals need to provide leadership on the curriculum, as well as administration and management. Mathematics HOD's and teachers should therefore protect the teaching time. They should ensure that a proper adherence to prescribed contact time between educator and learner attendance takes place. They should ensure that schools have time tables that comply with curriculum policy. Teachers should always be in class teaching. The value of safeguarding and maximizing contact time between educator and learner within a prescribed time allocation is simply priceless. Teaching and learning time is indispensable for syllabus coverage and the eventual learner performance. If teachers and learners are on time, on task, teaching and learning, success is guaranteed. Such things as syllabus backlogs and catch-up programmes are automatically eliminated. It is therefore essential that educators' absenteeism and class absconding be totally removed from schools.

Schools should ensure that period registers are established to have evidence of period attendance per week and quarter. This will ensure that classes are attended and there is full content coverage.

They should always check the rate of syllabus coverage per fortnight through the submission of fortnightly syllabus coverage reports.

There should be monthly subject meetings. These meetings should take the form of monthly reviews, performance assessment and analysis of learner results. Such analysis should be used for assisting learners with mathematical challenges.

Teachers should acquire a good knowledge of the subject matter. This will result in teachers teaching competently and confidently. A display of subject incompetence by a mathematics teacher causes the learners to lose confidence first in the teacher and then in the subject.

Teachers should ensure that learners should understanding rather than memorization. The problem many learners have with mathematics is that many rules and concepts are memorized. Some of them memorize steps of solving problems without understanding. Rules, problem solving and concepts should not be memorized. Teachers should therefore help improve learners' conceptual understanding.

Principals should ensure that their schools are mathematically well resourced. Resources are used in class to stimulate and maintain learners' interest in mathematics learning as well as facilitate their understanding of mathematical topics. They help in the formation of concepts in learners' minds. Mere telling without exposing the learners to the concrete materials does not enhance learning. It is therefore recommended that models, pictures, drawings, graphics, manipulatives and charts should be used in explaining mathematical concepts and relations.

Teachers should ensure that mathematics homework and classwork, as well as all formal tasks are set, completed and marked. The process of giving learners written work, checking that it has been done and then marking it in order to assess whether learners have understood what has been taught, needs to be a ritual that is performed every day in every mathematics class. Corrections should always be done, and learners should immediately receive feedback. Teachers should use the results of these tasks to monitor learner performance and to identify those learners who are struggling and who may need additional support. Teachers should always do item analysis of each task to determine problem areas and plan remedial strategies. When learners make mistakes it is important to interrogate their thinking. This is best done by asking them to explain the process they followed to reach their answer. This unpacking process will help learners to become aware of their thinking process and often helps identify misconceptions formed about a particular mathematical operation.

Teachers should improve their test and class activity setting skills. According to Luneta (2013, p.43), wrong questioning techniques can cause learners to make mistakes. Teachers should therefore set questions using exemplars and questions from work books. Questions should be spread over the four cognitive levels as required by policy (Knowledge 20%, Routine procedures 45%, Complex procedures 25% and Problem solving 10%). This will make it easier for learners to face examination questions.

In mathematics, regular practice in performing the tasks that will be tested is key activity. Teachers should give learners plenty of work. They need to leave the mathematics classroom exhausted from the hard work that they have been doing with their minds, not bored from listening to long explanations from their teachers. Mathematics is learned by doing, hands on.

Principals should build competent bureaucracy, and increase accountability at all levels of management of schools. Mathematics' supervision should be improved. Mathematics' HOD's should utilize subject policies which are clearly articulated to teachers. Every mathematics teacher should know what and when to teach, what, when and how to assess as well as what and when to submit for moderation. The culture of accountability should be cultivated and strengthened, while the culture of blame-shifting should be done away with. Efficient leadership and management in a school promote accountability and a healthy working environment. Such a school is also

characterized by a clear vision, mission and goals resulting in vibrancy and functionality. This creates a fertile background for effective teaching and learning that will result in complete content coverage. The absence of the above mentioned characteristics in a school results in a dysfunctional school. Both teachers and their HOD's should have clear, structured, personal and subject improvement plans, outlining the steps they will take to help learners who are underperforming.

RECOMMENDED TIPS FOR LEARNERS TO SUCCEED IN MATHEMATICS

Learners should always be punctual and attend all the periods. They should never skip a period unless if there is a serious problem. Missing a single period is a recipe for disaster.

They should improve their conceptual understanding. Mathematics is built around concepts and learners should be made aware that conceptual understanding will go a long way in making it easier for them to understand rather than memorizing mathematics problems, which will in turn result in meaningful mathematics understanding.

Learners should practice daily. They should work all the problems in their workbooks and textbooks. Learners should know that there is no substitute hard work. They should resist the temptation of copying answers from their classmates. They should be made aware that the more problems they work out on their own, the more comfortable they will be during class and during exams. Learners should not get discouraged if they sometimes fail to get correct answers. Learners should always try to get help when necessary. If a learner comes across a problem, he or should immediately consult his or her peers or mathematics teacher. A delay will result in frustrations, and consequently a negative desire and attitude towards mathematics will develop. They should be made aware that persistence always pays off when it comes to mathematics.

If the DBE, the teachers and learners can implement all the recommended tips, surely learners' competency in grade 9 mathematics will improve.

REFERENCES

AMESA. (2013). AMESA Review of the Grade 9 ANA Mathematics Paper 2013. Pretoria: AMESA

Barber, M., & Mourshed, M. (2007). How the world's best-performing school systems come out on top. McKinsey & Company.

Carnoy, M. et al. (2011). The process of learning in South Africa: The quality of mathematics 4 teaching in North West Province. Technical Report. Stanford University School of Education & HSRC.

Department of Basic Education. (2008). Ministerial committee on learner retention in the South African schooling system march. Pretoria: Government Printers

Department of Basic Education. (2011a). Curriculum and Assessment Policy Statement (CAPS) FET Band Mathematics Grades 10 – 12. Pretoria: Government Printers.

Department of Basic Education. (2011b). Curriculum and Assessment Policy Statement (CAPS) Mathematics: Senior Phase. Final Draft. Pretoria: Government Printers.

Department of Basic Education. (2013). Report on the Annual National Assessment of 2013 Grades 1 to 6 & 9. Pretoria: Department of Basic Education.

Khatoon, T. & Mahmood, S. (2010). Mathematics anxiety among secondary school students in India and its relationship to achievement in mathematics. European Journal of Social Sciences, 16:75-86.

Llewellyn, D. (2005). Teaching High School Science through Inquiry. United Kingdom: Corwin Press.

Luneta, K. (2013). Teaching Elementary Mathematics. Learning to teach elementary mathematics through mentorship and professional development. Saarbrucken: LAP LAMBERT Academic Publishing GmbH & Co. KG.

Luneta, K (2011) Initial Teachers Education in Southern Africa; mentorship and teaching practicum supervision. Saarbrücken: LAP LAMBERT Academic Publishing GmbH & Co. KG

Mji, A., & Makgato, M. (2006). Factors associated with high school learners' poor performance: A spotlight on mathematics and physical science. South African Journal of Education. Vol. 26 (2) pp. 253-266.

NPC. (2012). National Development Plan 2030: Our Future - Make It Work. Pretoria: National Planning Commission, Presidency.

OECD. (2005). Teachers Matter: Attracting, Developing and Retaining Effective teachers. Paris: OECD Publications.

Ragpot, L. (2013). Data Analysis: Thematic and content analysis. University of Johannesburg: South Africa. 16 March 2013.

RESEP & Oxford Policy Management. (2012). Consolidated Report: Public Expenditure Analysis for the Basic Education Sector in South Africa. Report for the Director of Basic Education. UNICEF.

Spaull, N. (2013). South Africa's Education Crisis: The quality of education in South Africa 1994-2011. Report Commissioned by CDE. Johannesburg

Taylor N. (2007). Equity, efficiency the development of South African Schools. In Townsend T. (ed). International handbook of school effectiveness and school improvement. Dordrecht: Springer

Taylor, N., & Reddi, B. (2013). Writing and learning mathematics. In Taylor, N., Van der Berg, S., & Mabogoane, T. Creating Effective Schools. Cape Town: Pearson.

Taylor, N., & Taylor, S. (2013). Teacher knowledge and professional habitus. In Taylor, N., Van der Berg, S., & Mabogoane, T. Creating Effective Schools. Cape Town: Pearson.