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# The Effectiveness of Grade 9 Mathematics Teachers in Mahwelereng Circuit Secondary Schools

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**Abstract**
Teacher effectiveness plays an important role in the teaching and learning processes as aspects of education. The purpose of this study was to investigate the effectiveness of grade 9 mathematics teachers and its influence on learner performance. The study was led by three research objectives which were to examine the influence of teacher effectiveness on learner performance in mathematics, to explore what teachers can do to improve their teaching effectiveness of grade 9 mathematics, and to identify the qualities and attributes that influence learner performance in mathematics. It is important to address these questions to help school districts and policy makers in finding the solution to close the gap. An evaluation tool like a Teacher Effectiveness Rubric or Teacher Evaluation Rubric Score for a specified school year can be implemented. Research was conducted around it and relevant literatures were reviewed on themes and findings that emerged from different authors concerning effectiveness of mathematics teachers. This study involved five secondary schools and participants were five grade 9 mathematics teachers and their heads of departments. All participants were purposely selected. Participants agreed to take part by signing consent forms. Data collection was done using interviews, observations, and document analysis. Semi-structured interview questionnaire was conducted, and data was analyzed thematically. Findings recommended future research on how well teachers can approach teaching mathematics effectively and effective teaching methods that can help learners perform better in mathematics. The results provide information on how to increase teacher effectiveness with necessary support.

**Keywords:** teacher effectiveness, Grade 9 Mathematics, learner performance, qualities and attributes, teacher evaluation.

## 1. Introduction

Teacher effectiveness plays an important role in the learning and teaching process as aspects of education. This study aims to explore the effectiveness of grade 9 mathematics teachers and its impact on learner performance. A wide variety of research was conducted around this issue of teacher effectiveness, and the impact it has on learner performance in mathematics, but the researcher feels it is still important to do more research because Mathematics is a compulsory subject for all South African learners. It is a difficult subject for many learners to effectively learn. In grade 9 mathematics teaching, teachers need to be as effective as possible to enable learning since this subject has consistently remained a major subject in global competition (Kaiser, 2020). Mathematics is treated as important because of its extreme value and significant in workplaces (Odeyemi-Bsd, 2020), therefore learners' poor performance in mathematics has become a global concern, and many schools worry a lot about this (Arends, Winnaar & Mosimege, 2017; PISA, 2018). There is a trend of failure among South African learners' mathematics performance from 2013 to 2015, and according to the report by the Human Sciences Research Council (HSRC, 2011) the most affected group is grade 9 learners (DoE, 2014). The HSRC stated that there is no noticeable improvement.

In Australia, government and policy makers realized that evaluating teacher quality and effectiveness is the key to improve students' educational outcomes. This conclusion stems from the ranking of Australian students' declination on international rankings of literacy, numeracy, and science (Thomson, De Bortoli, & Buckley, 2013). The trend of declining continued until 2015 with PISA results of measurements in mathematics, science and reading literacy (OECD, 2016). Value Added Modelling among other tools was recommended. Policy makers and researchers doubted this measure, saying that it can fluctuate over time and not be evenly distributed (Stronge, Ward, & Grant, 2011). Darling-Hammond, Amrein-Beardsley, Haertel, & Rothstein (2012) criticized VAM models as accurate measures of teacher effectiveness, as inconsistent, reasonable, and unable to disentangle many influences on student progress.

This has been a problem in Nigeria where they were facing students' poor performance in core subjects, especially mathematics, science and technology (Gimba, Hassan, Yaki, & Chado, 2018). From the finding of one study in Nigeria, they intend to implement necessary measures to effect a positive change through seminars for the mathematics teachers. Based on the findings of the study made by Mobolaji, Abiodun David, 13/25PD010 (2017) in Nigeria, mathematics teachers would be adequately motivated in terms of awards or prize giving to reinforce their positive effective teaching attitude. Findings in secondary schools in Ilorin, Kwara state, Nigeria, shows that mathematics teachers have built a strong teacher-student relationship which helped built interest of the students in mathematics.

In 1994 mathematics was perceived as a compulsory school subject until grade 9. From here learners have a choice of either to continue with mathematics or opt for mathematical literacy as an alternative for learners who were not competent in grade 9 mathematics. This was done to make mathematics to be accessed by all learners. It was stated in one of the articles from the Department of Basic Education (2015) that though mathematics was not compulsory under the previous education system, in the new system all learners must take either mathematics or mathematical literacy in the FET band (DBE, 2015). This is done to retain the compulsory status. The Department of Basic education (DBE) in South Africa identified the Annual National Assessments (ANA) as a means for improving education quality in the lower grades. This was a critical measure applied after the apartheid system, aimed at developing and training underperforming schools and teachers (DBE, 2013) after the poor performance in mathematics. Research has shown that the problem of underperformance in mathematics still persists, and among other problems most teachers complaint about lack of resources. According to Taylor and Reddi (2013), lack of resources is a contributory factor to learners' negative attitude towards mathematics. Some teachers blamed the curriculum change over the years, which also affected content to be taught in different grades. Spaull (2013) in the CDE report asserted that South Africa is facing underperformance in mathematics education because of poor teaching of mathematics in great majority of schools. Head of Department of Basic Education's National Education Evaluation and Development Unit (NEEDU), argues that poor learner performance in most schools is due to poor subject knowledge of teachers, especially in mathematics.

The researcher's opinion is that though teachers have knowledge of the subject and are qualified to teach, the problem is in the method they use to impart this knowledge to learners. Hence, teacher effectiveness is compromised. From my experience as a teacher, I realized that grade 9 learners are not performing up to standard in mathematics in general. Due to shortage of mathematics teachers few years ago, I was allocated grade 8 and 9 mathematics classes at my school. I am not qualified to teach math, as such it was a bit challenging because my learners did not have a strong foundation in mathematics from primary.

My teaching approach made them to develop a negative attitude in mathematics. They were therefore unable to perform well. Tata (2013) justifies this fact in the study he did in Nigeria, saying that most learners' negative attitude, fear of math and inadequate qualified teachers were some of the causes of poor performance in mathematics. It is against this background that the researcher wants to make research on the effectiveness of teachers who teach mathematics in grade 9. In this qualitative study the researcher will look into the concepts of teacher effectiveness and learner performance in mathematics. This research is important because it will help mathematics teachers in realizing that their dedication in teaching will give rise to their effectiveness, which in the researcher's opinion is equated with learner performance. In other words, effective teachers make learners perform well under any circumstances. The researcher believes that there is a positive relationship between teacher effectiveness and learner performance. An effective teacher must have a high expectation about learning.).

## 2. Methodology

### 2.1 Participants

A population connotes all individuals of specific communities of similar characteristics (Kothari, 2004) or a single group (Chaudhury, 2010). The general population of this study population constituted educators in the five secondary schools of Mahwelereng circuit, heads of departments and learners. The target group was grade nine mathematics teachers, heads of mathematics departments, and some grade nine learners from sampled schools. This study used purposive sampling technique to 10select grade nine mathematics teachers for the 2020 school year from five sampled secondary schools out of 11 secondary schools in Mahwelereng circuit. The sample includes HODs responsible for mathematics departments in the selected schools. Learners did not participate in the study.

**2.2 Design**

A design is a plan used to solve the posed challenge (Creswell, 2003). There are six qualitative research designs: conceptual, historical, action research, case study, ethnography, and theory building (Creswell, 2013). Secondary sources are dealt with in conceptual research, historical research requires identifying, analyzing and interpreting the past, and action research is used by researchers to improve their practice. A case study is regarded as a unique entity to identify its characteristics that could be of interest to the communities. Phenomenology encompasses an occurrence of interest to the researcher, and ethnography describes the community cultural set-up. This case study allows the researcher to understand teacher-effectiveness in teaching grade nine learners.

**2.3 Materials**

This qualitative study is concerned with understanding the socio-cultural contexts of participants or events. Qualitative research is a collection of research methods focusing mainly on data collection usually collected using interviews. According to Mason (2010), the qualitative research approach allows the researcher to get rich information on the study. The researcher adopted the social constructivism paradigm, which includes the cultural and social context (Botha, 2011).

**2.3 Procedure**

**2.3.1 Interviews**

Interviews were used to collect data. The semi-structured interview (Dawson 2002) helped the researcher gather information from participants. The interesting part of this interview is when it runs flexibly for the researcher to explore other important information that will arise in the interview session, though not planned. Prior to conducting interviews, the researcher explained confidentiality procedures to participants and assured them that she would uphold confidentiality anonymity of all participants and data collected. The interviews involved one-to-one semi-structured conversations but were open enough to allow for the depth of discussion and exploration. The researcher presented the same questions to each participant and approached each participant in the style to ensure validity. Each interview was audio-recorded for 30 minutes with permission from the participant. Finally, the researcher transcribed data verbatim took notes and reflected on the data collected.

**2.3.2 Observation**

Blessing and Chakrabarti (2002), state that observation involves recording the occurrences. When the researcher is completely immersed in a culture, participant observation will be used to gain more knowledge and a deeper understanding. Observation is where the research records notes or events (Emerson et al., 2011) and watches and records episodes as they happen (Mertler, 2016). In this study, observation was done on mathematics teachers in their classrooms, which imply the application of teaching styles and methods they use, how learners were involved in the teaching and learning processes meaning the activities they participated in, and whether all these could add to the effectiveness of the teacher concerned.

### 2.3.3 Documents

According to Omari (2011), documents provide information to triangulate interviews or other data collected in the research. Mare (2010), states that documents include published and unpublished documents, reports, memoranda, files, ledger books, textbooks, and agendas used in the investigation. In this study, the researcher used mathematics files of teachers, external and internal examination files, and learners' books.

## 3. Results and findings

In the interview conducted with teachers from sampled schools, the researcher was told that mathematics challenges many schools. There are challenges like learners lacking mathematics basics or background knowledge from the primary level. They start with those basics in their teaching and by the time the learners grasped them, there is not enough time to cover the syllabus as per CAPS. This results in learners not performing well at the end of each term. One of the teachers interviewed stated that the problem of mathematics poor performance in grade nine was because of the pass requirements, an average of 40%.

Learners are not promoted to the next grade level unless they have achieved an overall average at least 40%. Teachers believe that the problem is caused mainly by being promoted to age cohorts from the lower grades irrespective of their performance. When asked how management systems help to overcome the problem, one of the teachers said it is not helping because the departmental heads are not supportive. All they do is supply you with the Annual Teaching Plans to make an interpretation and plan your lessons. From there, they check the amount of written work given to learners on every week. This is a tool that forces teachers to concentrate on covering ATP instead of ensuring learners understood what was taught.

According to some teachers, the subject advisors should help them to make learners pass, but they blame them when learners fail. These teachers agree with subject advisors to inspect instead of giving them support. They check for curriculum coverage and the number of tasks given to learners per week. They are not even concerned with the standard of the tasks. Theirs is just signing to show that they visited those schools. The following tables depict the summary of 2020 results of grade 9 of the sampled schools.

### 3.1 Descriptive statistics

*Table 1 – Final grade nine results for school A)*

| SUBJECT | NO. WROTE | NO. PASSED | PASS % | NO. FAILED | FAIL % |
|---|---|---|---|---|---|
| Sepedi HL | 230 | 212 | 92.2 | 18 | 7.8 |
| English FAL | 230 | 223 | 97 | 7 | 3 |
| Creative Arts | 230 | 228 | 99 | 2 | 1 |
| EMS | 230 | 192 | 83.4 | 38 | 16.6 |

| | | | | | |
|---|---|---|---|---|---|
| Life Orientation | 230 | 208 | 90.4 | 22 | 9.6 |
| Natural Sciences | 230 | 113 | 49.1 | 117 | 50.9 |
| Social Sciences | 230 | 220 | 95.7 | 10 | 4.3 |
| Technology | 230 | 194 | 84.3 | 36 | 15.7 |
| Mathematics | 230 | 143 | 62.2 | 87 | 37.8 |

Table 1 shows the performance of grade 9 learners in all the subjects in school A. However, the last row is of particular interest in this study. It shows that 62, 2% of the learners managed to pass Mathematics in Grade 9. This result indicates that their teacher used effective methods to impart mathematical knowledge. Eighty-seven learners (87), which amounts to 37.8% learners failed grade 9 mathematics in school A, which indicates that a significant number of learners this school struggle in mathematics and hence requires the teacher to reflect on the effectiveness of his/ her teaching methods.

***Table 2 – Final grade nine results for school B***

| SUBJECT | NO. WROTE | NO. PASSED | PASS % | NO. FAILED | FAIL % |
|---|---|---|---|---|---|
| Sepedi HL | 99 | 74 | 75 | 25 | 25 |
| English FAL | 99 | 90 | 91 | 9 | 9 |
| Creative Arts | 99 | 94 | 95 | 5 | 5 |
| EMS | 99 | 85 | 86 | 14 | 14 |
| Life Orientation | 99 | 97 | 98 | 2 | 2 |
| Natural Sciences | 99 | 98 | 99 | 1 | 1 |
| Social Sciences | 99 | 65 | 66 | 34 | 34 |
| Technology | 99 | 85 | 86 | 14 | 14 |
| Mathematics | 99 | 19 | 19 | 80 | 81 |

Table 2 shows the final grade nine results for school B. The lowest pass rate (19%) was recorded in Mathematics. This indicates that majority of learners in this school are struggling in Mathematics, and this suggests that the methods employed by the teachers are not very effective in helping learners to understand mathematical concepts.

***Table 3 - Final grade nine results for school C)***

| SUBJECT | NO. WROTE | NO. PASSED | PASS % | NO. FAILED | FAIL % |
|---|---|---|---|---|---|
| Sepedi HL | 179 | 168 | 94 | 11 | 6 |
| English FAL | 179 | 166 | 93 | 13 | 7 |
| Creative Arts | 179 | 176 | 98 | 3 | 2 |
| EMS | 179 | 136 | 76 | 43 | 24 |
| Life Orientation | 179 | 175 | 98 | 4 | 2 |
| Natural Sciences | 179 | 155 | 87 | 24 | 13 |
| Social Sciences | 179 | 160 | 89 | 19 | 11 |
| Technology | 179 | 167 | 93 | 12 | 7 |
| Mathematics | 179 | 93 | 52 | 86 | 48 |

The results in table 3 shows that learners in school C had a pass rate of 52% and a failure rate of 48%. This means that the teaching and learning methods used by the teachers are not effective for all the learners. It is therefore important for the teacher to reflect on these methods to ensure that they cater for all learners.

*Table 4 – Final grade nine results for school D)*

| SUBJECT | NO. WROTE | NO. PASSED | PASS % | NO. FAILED | FAIL % |
|---|---|---|---|---|---|
| Grade 9 | 46 | 9 | 20 | 37 | 91 |

School D could not furnish the researcher with a summary per subject but per grade. According to interviewed teachers, the general results at this school are poor because of the poor outcomes in mathematics. All the learners who were not promoted in grade 9 did not perform well in mathematics. It is compulsory to pass mathematics to be promoted to a higher grade or next grade.

*Table 5 - Final grade nine results for school E*

| SUBJECT | NO. WROTE | NO. PASSED | PASS % | NO. FAILED | FAIL % |
|---|---|---|---|---|---|
| Sepedi HL | 53 | 47 | 89 | 6 | 11 |
| English FAL | 53 | 48 | 91 | 5 | 9 |
| Creative Arts | 53 | 42 | 79 | 11 | 21 |
| EMS | 53 | 44 | 83 | 9 | 17 |
| Life Orientation | 53 | 45 | 85 | 8 | 15 |
| Natural Sciences | 53 | 42 | 79 | 11 | 21 |
| Social Sciences | 53 | 30 | 57 | 23 | 43 |
| Technology | 53 | 46 | 87 | 7 | 13 |
| Mathematics | 53 | 38 | 72 | 15 | 28 |

The results for grade 9 learners' performance in Mathematics are shown in table 5. The results indicate that 38 (72%) of the learners passed mathematics while 15 (28%) failed the subject. The high pass rate could be attributed to the effectiveness of the methods used by the teacher in this school.

*Table 6 - Final grade nine results for school C)*

| SUBJECT | 2020 TERM 4 | | 2021 TERM 2 | | 2021 TERM 3 | |
|---|---|---|---|---|---|---|
| | Pass % | Fail % | Pass % | Fail % | Pass % | Fail % |
| A | 48 | 52 | 62 | 38 | 96 | 4 |
| B | 19 | 81 | 78 | 22 | 19 | 81 |
| C | 52 | 48 | 14 | 86 | 2 | 98 |
| D | 20 | 80 | 38 | 68 | 79 | 21 |
| E | 72 | 28 | 78 | 21 | 70 | 30 |

The table 3.1.6 represents grade nine results of 2020 term four, and 2021 terms two and three. It shows that learners fail during the year but many pass at the end year. The researcher questioned teachers why this was happening. Many progressed because when schedules are submitted for approval, the district advises schools to make amendments that will make them pass.

## 4. Discussion

### 4.1 The problem of poor performance in mathematics in the senior phase with emphasis on grade 9 learners.

In the interview conducted with teachers from sampled schools, the researcher was told that the problem of poor performance in mathematics is a challenge in many schools. The teachers stated challenges like learners not having the basics or background knowledge of mathematical concepts from the primary level. They start with those basics in their teaching and by the time the learners grasped them, there is not enough time to cover the syllabus as per CAPS. This results in learners not performing well at the end of each term.

One of the teachers interviewed stated that the problem of underperformance in grade 9 mathematics is because of the pass requirements, which is an average of 40%. Learners are not promoted to the next grade level unless they have achieved an overall average at least 40%. From their view, teachers believe that the problem is caused mainly by being promoted on age cohort from the lower grades irrespective of their performance. When asked how management systems help in overcoming the problem, one of the teachers said it is not helping because the departmental heads are not supportive. All they do is just supply you with the Annual Teaching Plans for you to make an interpretation and plan your lessons around it. From there they check the amount of written work given to learners on weekly basis. This a tool that force teachers to concentrate on covering the scope of the ATP instead of making sure that learners understood what was taught.

According to some of the teachers, the subject advisors should be helping them to make learners pass, but instead they blame them when learners fail. The same teachers agree on the idea that subject advisors visit them to witch hunt instead of giving them support. All they do is check for curriculum coverage and the number of tasks given to learners per week. They are not even concerned with the standard of the tasks. Theirs is just signing to show that they visited those schools.

### 4.2 What teachers can do to improve their teaching effectiveness of Mathematics

At one of the sampled schools, the grade 9 mathematics teacher told the researcher that team teaching can be the solution to the problem of underperformance of learners and ineffectiveness of teachers. According to this teacher, effectiveness is when the teacher produces quality performance and good results in their subject. At this school, there are three grade 9 mathematics teachers. Each of them is assigned one class of grade 9. They are teaching different topics and assess learners differently. In other words, learners of the same grade get different class works, homework, assignments and investigations. They only write similar tasks during a common examination paper, or a controlled test set by one of the teachers. The teacher concerned will set the test according to what he or she taught learners, which makes other learners who are not taught by this teacher to fail.

The teacher also mentioned that besides team teaching, they have to use different teaching methods in delivering their mathematics lessons so as to accommodate all learners. This can help them improve their teaching effectiveness according to her. In another school one teacher mentioned that to increase in effectiveness, more workshops are needed in the subject they teach, so that they renew and expand their knowledge of mathematics, because they still depend on what they did in their institutions. This teacher mentioned a similar problem that concerns their subject advisors. He says they cannot improve in their effectiveness because they do not get help from their immediate seniors like HODs and curriculum advisors who always blame them for failing learners.

The researcher interviewed five departmental heads, each from the five sampled schools. In one of the schools, the departmental head raised a concern that some of their teachers cannot team teach. They do not adhere to the ATP and the number of tasks that should be given to learners per week or term. They teach for long without assessing learners and depend on common and controlled tasks.

A DH at one school said that teachers can conduct one on one lesson session with learners, and extra lessons to impart more knowledge in learners' minds. Besides this he also made mention of teacher clusters from different schools who sometimes meet to share their experiences and knowledge (Jita & Mokhele, 2014). This form part of development and can benefit many teachers in gaining insight in the subject.

**4.3 Teacher qualities and attributes that can influence learner performance in mathematics.**

A teacher's knowledge of the subject is likely to make an effective teacher. There is no way for a teacher who does not master the subject to be effective in teaching. This knowledge as attested to by some of the teachers, relate very well with learner performance according to Carnoy & Arends (2012). One of the interviewed teachers does not agree with what others say. According to her there is no correlation between teacher effectiveness and learner performance.

Another teacher said that teacher qualities have to do with knowledge of the content matter, to love what you are doing as the teacher, to be patient and tolerant at all times, to be determined and dedicated to your work. Discipline, attitude, behavior, and competency is also mentioned in the interview. Personality of the teacher was also mentioned as being significantly related to learners' mathematics achievement. They say whether a teacher is liked or disliked by learners, influences the learners' attitude towards their subject, and subsequently their achievement.

Development of the teacher is also very important. Teachers should attend workshops on new developments in mathematics education. This will make in-service programs worth attending, for teachers. Interviewed teachers wish that theses in-service training should be scheduled at least two times in a year to add to whatever personal development programs they registered for. This will keep them abreast of new developments in this subject.

What the interviewed teachers said is that they do not believe that teacher experience has anything to do with the performance of learners in mathematics. What they believe in is the teaching strategies followed. They say involving learners from the onset in your lesson will make it easier for them to love the subject, even participate in answering questions. Let them try to solve mathematical problems on the chalkboard in your presence and only guide where necessary. One of the teacher participants mentioned the positive approach in teaching, saying that it creates meaningful learning environment for their learners improving their chances of performing high in mathematics.

**5. Recommendations**

The researcher sampled five schools in the circuit out of which results proved that there is dire need of improvement of learner performance in mathematics. This research can be extended to all schools in the district. The researcher recommends mathematics teachers to make it a point that they apply for developmental programs to equip themselves with knowledge that will help their learners to perform well in their subject.

Mathematics Department to make it a point that there are workshops planned at least twice a year for mathematics teachers to improve in their effectiveness by improving their knowledge of subject content in mathematics. Performing teachers could be recognized and awarded with prizes publicly at school gatherings and meetings. Teachers should also be encouraged to obtain further qualifications and skills in mathematics. Teachers should attend seminars, conferences and workshops that are made compulsory for teachers of all categories. A very important issue is for teachers to take the teaching job seriously and ensure without fail, attendance to their classes.

The District should develop a policy in terms of a rubric that could be used to assess teacher effectiveness, and this could also assist policy makers in the Education Department. Assessment of teacher effectiveness can help teachers to strive for excellence in their daily teaching and classroom attendance. The researcher is recommending future research to be done on the problem of poor performance in mathematics and what exactly causes that. The research must also be conducted on individual teacher factors that affect their teaching to the extend learners perform so poorly in mathematics.

**6. Conclusion**

Based on the findings of the study, the teachers selected for the study were 50/50 in terms of male and female participants. Though teachers said they were using different teaching methods, in the researcher's observations some of the methods were never used as teachers have to teach many periods as one of the teachers said in an interview. Some said there was no significant relationship between effectiveness of the teacher and learner performance. This kind of relationship according to one of the teachers motivates both teachers and learners. Teachers will attend classes regularly and learners will like the subject as they won't display negative attitude towards their teachers. Teacher's personality also plays a role in learner performance in the subject. Learners look up to their teachers, whether they like it or not, their perception of the teacher contributes to their achievement in the subject. Teachers' effectiveness therefore plays a very important role in student learning.

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