

# An Assessment Of Teachers' Perspectives On The Role Of Zame On Learner Performance In Mathematics At Grade 12 In Zambia: A Case Of Kabwe District

(Paper ID : CFP/1231/2019)

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**Abstract:** The aim of most subject teaching associations is to provide leadership and professional support for teachers within a subject specific domain. This study is an assessment of teachers' perspectives on the role of ZAME on learner performance in mathematics at grade 12. The study sought to; identify the causes of poor learner performance in mathematics, establish strategies employed by schools to improve learner performance in mathematics, identify the challenges faced by ZAME to improve learner performance in mathematics and establish appropriate strategies that could be employed by ZAME to enhance learning performance in mathematics at grade 12 in secondary schools of Kabwe district. The study used a case study research design. The target population were secondary schools of Kabwe district. The study comprised 57 respondents which 6 head teachers, 6 heads of department, 35 teachers of mathematics, 5 guidance and counselling teachers and 5 members of the ZAME district executive committee. Simple random sampling technique was used to select six secondary schools and the thirty-seven teachers. Purposive sampling was used to select the head teachers, heads of mathematics departments, guidance and counselling teachers and members of the ZAME district executive committee. Questionnaires were administered to all the respondents. Qualitative data was analysed according to emerging themes while quantitative data was analysed using micro soft excel. The study established that the contributory factors to poor performance included negative attitude, poor study skills, low literacy levels, dependency on calculators, absenteeism and dependency on exam leakage, lack of parental involvement, lack of competence, poor methodology, delayed exposure

to ECZ exam standards, not covering all topics and hasty coverage of the syllabus, lack of teaching and learning materials, inadequate teachers and bulky syllabus. In order to improve performance schools had increased assessments, conducted results analysis to appreciate performance trends, awarded learners who performed well, strengthened CPDs and internal monitoring, revamped mathematics clubs and embarked on procurement of more books. ZAME faced challenges such as lack of resources, low membership, low attendance of workshops, apathy by would be members and lack of support by administrators. ZAME as a subject association is valued as an important source of professional development for teachers through which teachers would become competent and effective. In order to lift the standard of performance in mathematics, ZAME was advised to embark on material production, create structures in lower levels, intensify monitoring of its programs, prepare common mock exams, quiz and olympiads, engage teachers in research, come up with a variety of activities for learners, intensify capacity building teachers from primary and secondary schools, conduct more interactive conferences, award teachers and learners for good innovations and performance and work with other stakeholders. The recommendations of the study were that ZAME should create structures at school and zonal level; intensify its programs; ensure all teachers of mathematics are members of ZAME and collaborate with other stakeholders such as CDC and ECZ to ensure smooth implementation of the curriculum and improved learner performance.

**Key words:** Learner, perception, performance, poor performance, mathematics content.

## I. INTRODUCTION

Many countries make mathematics as a compulsory subject in school from elementary to higher education because of the importance attached to the subject. Umameh, (2011) in Tshabalala and Ncube, (2013) was of the view that mathematics is bedrock and an indispensable tool for scientific, technological and economic advancement of any nation. In addition to that Davies and Hersh, (2012) see mathematics as the important subject not only from point of view of getting an academic qualification at school or college, but also is a subject that prepares the students for the future as well irrespective of which work of life they choose to be a part of Successive governments across several countries have emphasised the importance of increasing and widening participation in science, technology, engineering and mathematics (STEM) subjects and careers. Despite the value of the subject, low learner performance in mathematics in comparison to other subjects appears to be a global problem. Various strategies that have been employed to try to improve learner performance include inculcating a positive attitude towards the subject by the learners and teachers, provision of adequate learning materials, strengthening mathematics clubs, use of learner centered methods, conduction in-service training for teachers.

### 1.1 Background of the study

In the field of work there are different professions or careers. In order for one to be a professional one has to go through tertiary education at a college or university. It is at this level that one acquires the necessary knowledge and skills that can enable one to function competently in a specialized field of work. However, during the training period, one may be exposed to internship so which is aimed at exposing the trainee to the realities of the career chosen. MoE (1996) acknowledges that teacher education is a continuing process that must be extended during the individual's years of actual teaching as the foundation laid in pre-service programme while sound, may not be sufficient for life. Even after initial training, teachers need to have their subject knowledge updated and to discover new ideas. During the course of working, challenges arise, and these would call for

consultation with other technocrats. It is for this reason that most professions have associations whose main goal is to share experiences and find solutions to emerging problems. It is also through professional associations that members come up with new innovation and have the opportunity to network with other educators.

In the education sector, professional bodies may exist as subject association. Subject associations provide a source of subject support to teachers. Subject Teachers' Associations as groupings of people who are specialists in particular subjects, give teachers access to the important debates that deepen subject expertise. Subject associations and have a key role to play in sustaining and strengthening subject professionalism. Professional association meetings offer many professional development opportunities and cross institutional communication. Samuel (2015) observed that in most of the subject areas, experts and teachers come together primarily to contribute to the advancement of knowledge and teaching in the subject. Association of educators of mathematics are a common feature in most countries and play a vital role not only in teaching and learning of mathematics but also education system. They have common goals which focus promoting and improving mathematics education by enhancing acquisition of knowledge in the subject area by mathematics educators and learners. Knowledge is shared through conferences, workshops, newsletters, publication of journals, providing teachers with information about the curriculum and students activities such as Olympiads.

Professional bodies may exist at various levels such as international, regional, national and local/district level. Membership is voluntary and is drawn from educators of mathematics or anybody interested in the subject. In order to encourage the development of mathematics education that is more closely related to the needs of the learner Caleb Gattegno, in 1950 established The Association of Teachers of Mathematics (ATM). ATM is a membership organisation representing a community of students, nursery, infant, primary, and numeracy consultants, secondary and tertiary teachers. Though based in the United Kingdom, ATM also draws its membership from overseas teachers, academics and

anybody interested in mathematics education. The aims of the association are to support the teaching and learning of mathematics by encouraging increased understanding of how people learn mathematics, encouraging the sharing of and evaluation of teaching and learning strategies and practices, promoting the exploration of new ideas and possibilities, initiating and contributing to discussion of and developments in mathematics education at all levels. Apart from conduction conferences, the association publishes Mathematics Teaching, a journal that is circulated among its members. ATM seeks to support teachers to explore strategies that will enable learners to enjoy and discover mathematics.

Founded in 1966, The Australian Association of Mathematics Teachers is the main representative organisation of mathematics teachers in Australia at all levels. It has eight affiliated associations of teachers of mathematics, one from each Australian State. Members of each affiliate association are automatic members of the AAMT. It aims to; support and enhance the work of teachers, promote the learning of mathematics and represent and promote interests in mathematics education. AAMT publishes three journals for primary junior and senior secondary as a guide for the improvement and maintenance of teaching standards in mathematics in Australian schools. (AAMT 2013) through the *Standards for Excellence in Teaching Mathematics in Australian Schools* which were developed between 1999 and 2001 and adopted 2002, AAMT describe the knowledge, skills and attributes required for good teaching of mathematics. There are however associations at international level that are aimed at inspiring female educators in mathematics such as Association for Women in Mathematics whose mission is to support women and girls in mathematic.

In Zambia, there are different subject associations according to specialisation and The Zambia Association for Mathematics Education (ZAME) being one of them. Ndopu (2009) states that the creation of subject associations in Zambia where necessitated by the 1966 Education Act of Zambia CAP 134 section 28 of the Laws of Zambia which

provided for the establishment of teacher association. MoE (1996) recognises that meeting the diverse needs of teachers for on-going professional and personal development is too expensive a task to be the responsibility of the ministry alone hence requires the participation of a number of agencies working along different lines of approach. MoE (1992) concedes that teachers are one of the chief determinants of educational achievement in the classroom and their effectiveness depends heavily on their knowledge of subject matter and on their pedagogical skills. It adds that in-service training is necessary in mathematics given the general unsatisfactory performance in mathematics at all levels. MoE (1996) appreciates the significance of professional development and stresses on the need for teachers to attend to their own professional development in chosen areas of specialisation. Teachers are called upon to deepen their knowledge, extend their professional skills and keep themselves up-to-date as they have a responsibility not only to themselves but their profession as well. MoE (2007) acknowledges the existence of several professional associations established in Zambia that complement the effort the Ministry of education in implementing educational programmes and activities

All subject associations in Zambia were initially under the Directorate of Curriculum and Standards at Ministry of Education Headquarters until in 2018 when ZATE, ZASE, HEAZ and ZAME where moved to the National Science Centre. The National Science Centre (NSC) in the Ministry of Education is mandated with upgrading the teaching of Science, Mathematics and Technology (SMT) subjects. The centre seeks to promote SMT professional and subject associations to enhance professionalism among science, mathematics and technology teachers, and also to organize in-service training of teachers and teacher trainers in the use of materials in SMT subjects to upgrade their skills and competencies. Banda et al (2015) acknowledges the significant role Japans' assistance plays in Mathematics and Science to developing countries, Zambia inclusive. Ball (2000) observed that for the development of human resources contributing to scientific and technological development, the quality of mathematics and science education

(MSE) at the basic education level holds a key. Hence, many countries in Africa have been making efforts to improve the quality of MSE at primary and secondary levels.

ZAME has executive committees at national, provincial and district level. It draws its membership from not only from teachers of mathematics from primary, secondary schools and colleges but also any persons interested in mathematics education. The ZAME Constitution of 2018 states that the aim of the associations is to enhance the relevant and quality sustainable mathematics education in Zambia. ZAME (2018) brings out the objectives the association which among other things seeks to; Assist teachers of mathematics to keep up to date with the changes in mathematics education and help provide a contact between teachers of mathematics on one hand and the mathematics developers and examining bodies on the other.

Keeping teachers up-to-date is cardinal given that the Zambia curriculum was revised in 2013. Changes in the curriculum may be as a result of the changing needs of the society, and the need to be in tandem with the global community. MESTVEE (2013) observed that the curriculum review of 2013, in Mathematics and other subject areas, was necessitated by the need to provide an education system that would not only incorporate the latest social, economical, technological and political developments but also equip learners with vital knowledge, skills and values that are necessary to contribute to the attainment of vision 2030. The revised Ordinary level Mathematics curriculum of 2013 saw the realignment of some topics from senior to junior level and the introduction of new topics at senior level. The new curriculum sought that the teaching of Ordinary Level Mathematics should expose learners to practical applications of mathematics in everyday life where learners should be exposed to do more of practical work as much as necessary through contextual reference to the local environment. As mathematics plays a key role as a tool for learning other subjects and helps to develop and improve the learners' intellectual competence in logical reasoning spatial visualization, analysis and abstract thought, the revised curriculum also encouraged the use of computer related software for

mathematics by the teachers and learners. MESTVEE (2013) identifies the key competence for teachers at all levels in the curriculum and indicates that teachers' professional life revolves around knowledge and learners, hence the need for teachers to be kept abreast with new developments and individual needs of the learners.

## 1.2 Statement of the problem

Mathematics plays a key role as a tool for learning other subjects and it helps to develop and improve the learners' intellectual competence in logical reasoning spatial visualization, analysis and abstract thought. Pandor (2006) states that importance of having a solid background in mathematics is well recognized as it serves as a gateway to future professions in a variety of fields. While Hakalo (2014) observed that good performance in mathematics has become a pre-requisite for entry into tertiary education, Kafata & Mbetwa (2016) adds that high scores in mathematics and science subjects at grade 12 O-Level examinations would be the strongest predictors of academic performance in engineering. However, the problem of the study emerges that currently in Zambia as learner performance in mathematics over the years has remained very low in comparison to other subjects. (Kafata & Mbetwa 2016, Aduda 2003).

Year	2013	2014	2015	2016	2017	2018
Mean pass %	26.5	17.4	17.4	24.39	28.29	25.46

Source: ECZ Examination Performance Reports 2013-2018

ECZ (2017) observes that mathematics is still posing a challenge to candidates even under the revised curriculum and had the highest proportion of candidates' failure at 41.33%. This is despite Zambia Association for Mathematics Education which aims to enhance the relevant and quality sustainable mathematics education in Zambia and also seeks to help provide a contact between teachers of mathematics on one hand and the



mathematics developers and examining bodies on the other. What is the association doing amidst these poor results? There is need to establish challenges and prospects of viable ZAME activities or programmes that can help improve learner performance in mathematics at grade 12.

### 1.3 Objectives of the study

- i. To identify the causes of poor learner performance in mathematics in Kabwe district.
- ii. To establish strategies employed by schools to improve learner performance in mathematics at grade 12 in secondary schools of Kabwe district.
- iii. To identify the challenges faced by ZAME to improve learner performance in mathematics at grade 12 in secondary schools of Kabwe district.
- iv. To establish strategies that can be employed by ZAME to enhance learning performance in mathematics at grade 12 in secondary schools of Kabwe district.

## II. LITERATURE REVIEW

### 2.1 Causes of poor performance

Mathematics is essential for daily life and plays a crucial role in school curricula yet students' performance remains very low worldwide. Mathematics is a pillar of almost all the streams in academic sectors and plays an important role in tertiary education and most careers. Factors contributing to poor learner performance can be internal or external to the learner. Researchers have attributed the problem to learners themselves, teachers and parents or administrative as contributing to the performance of the learner in one way or the other.

Major causes of poor performance in mathematics among senior secondary school students include misconception of the subject (mathematics) as difficult one, fear and anxiety. Attwood (2014) stated that students often develop mathematical anxiety in schools, often as a result of learning from teachers who are themselves anxious about their mathematical abilities in certain areas. A study by Abramson (2015) entitled Factors leading to Student poor performance in

Mathematics in Brazil, showed that 43.8% of the teacher respondents considered students negative attitude as a major cause of students' poor performance. Another 31.3% felt that low entry marks at form one level contributed to students' poor performance in mathematics and 25.4% considered lack of interest in Mathematics as a major factor contributing to students' poor performance. Other factors cited by the teachers included chronic absenteeism of students, inadequate revision materials, cheating of students in assignments to create a perception that they can do well and therefore are not able to perform in exams among others.

Similarly, Tata (2013) made his study in Nigeria and came out with findings that, students' negative attitude toward mathematics and fear of mathematics were some of the causes of poor performance in mathematics. In a study by Nakawa (2010) on factors contributing to students' poor performance in mathematics in public secondary schools in Lusaka observed that the low achievement of pupils in Mathematics at School Certificate is attributed to many factors like lack of self-esteem, belief, value and recently investigated affect or anxiety. The lack of interest and negative attitude toward learning mathematics is also assumed to influence learning and achievement in Mathematics. According to Sidhu (2002, p.133), "To arouse and maintain the student interest in Mathematics is a major problem for the teacher. He/she should know that loss of interest is one of the principal causes of student failure." Lack of interest by pupils should not be allowed to prevail in a class, as effective learning might not take place. When pupils express lack of interest in the subject it affects the way, they react or listen to the teacher hence, a pupil's attitude toward Mathematics serves as predictor of proof of his performance in Mathematics.

A research by McCallum (2015) in 'Parents' Attitudes toward Mathematics and the Influence on Their Students' Attitudes toward Mathematics: A Quantitative Study: Parents' Attitudes toward Mathematics in the US', suggests that a student's parents may influence their attitude toward mathematics and parental involvement can increase student achievement. As a result, it is imperative

that teachers involve parents in their child's mathematical learning. Although some parents do not have the mathematical content knowledge or pedagogical knowledge for teaching, parents feel more competent in their mathematical ability and interact more with their child when teachers reach out to them. Parental engagement and support are crucial when students are deciding whether or not to pursue science, technology, engineering, and mathematics (STEM) courses. Parental aspiration and expectation of their child's achievement has a strong relationship with academic success, which in turn is related to their child's attitude toward the subject. For example, children who have high mathematics achievement generally have parents who support their mathematical ability and success.

According to Karue and Amukowa (2013) home environmental factors and family backgrounds are the main causes of poor performance in mathematics in Kenya certificate of secondary examination in Embu District in Kenya. Hox (2010) in 'Relationship between Parent and Student Attitudes toward Mathematics in Kwa Zulu' claims parents generally get involved with their child in mathematics when they have high self-efficacy toward mathematics themselves and when they feel the school supports their involvement. Consequently, it is important for teachers to provide opportunities for parents to get involved and provide necessary tools for parents to help teach their children. However, some teachers and schools usually are not aware of ways to involve parents in such learning experiences especially when some parents may have negative attitudes toward mathematics. As one approach, researchers suggest family math nights where parents, teachers, and students participate in fun, engaging mathematical activities together that not only provide education stimulus for students, but also prepare parents to help their children with the material.

According to Mata (2012) in 'Parents' Attitudes toward Mathematics Survey in Zambia', attitudes, emotions, and beliefs make up the affective domain in mathematics education. Attitudes involve "positive or negative feelings" toward an object, place, or thing. Specifically, attitudes refer to "affective responses that involve positive or negative feelings of moderate intensity". It is an

individual's like or dislike toward mathematics. Mata (2012) claims parents' positive support helps students develop positive attitudes about the social importance of mathematics. But it is common that parents struggle helping their children learn and understand mathematics.

Many parents feel inadequate helping their children with mathematics because they are not confident in their own mathematical ability, are unaware of the content, or do not have the teaching skills needed to help their child. Mata (2012) argues parents who have low-income status are likely to help their child more with reading than with mathematics because they claim mathematics is not as important to everyday life, and they are not confident in their own mathematical ability. The changes in the way mathematics are taught may also contribute to this feeling of incompetency. It has been found; however, when parents are taught how to work with their children, especially on mathematical concepts, they develop a better attitude toward school and the subject matter, which could influence students' attitudes toward mathematics. Parents who have negative feelings toward mathematics, or who have openly acknowledged their own mathematics deficiencies tend to have children with similar attitudes. On the other hand, parents who encourage mathematics and mathematical thinking and have positive feelings toward the subject tend to have children who also enjoy it, making them more likely to succeed.

The National Institute for Educational Development (NIED) (2010) found out in Britain that the reasons for poor performance in mathematics from the point of views of principals are shortage of well-trained teachers and lack of interest among teachers all hamper the smooth acquisition of mathematics knowledge. In addition to the above causes of poor performance in mathematics, Stan (2002) was of the view that prominent causes of poor performance in mathematics in Kenya are acute shortage of qualified professional mathematics teachers and exhibition of poor knowledge of mathematics content by many mathematics teachers.

Additionally, Mwenda (2013) in Factors Contributing to Students Poor Performance in Mathematics in Public Secondary Schools in Tharaka South District, Kenya, reports that the performance of students in mathematics has been generally poor as compared to other subjects in Kenya and in particular Tharaka South district. This is due to inadequate qualified mathematics teachers. Qualified teachers play a central role in the coverage of the syllabus, preparation of students for evaluation and motivation of learners. The quality of teaching mathematics is affected by the methods of lesson presentation by the teacher trainees in the subject. In some schools, there were no professionally trained mathematics teachers as the schools had employed form 4 graduates and university students to facilitate learning of mathematics.

The issues in Mathematics education in Zambia according to Nakawa (2010) and Nonaka (2013) have indicated that students in Zambia have very low performance due to teachers' low competence and their limited views on Mathematics lessons. Nakawa (2010) has also indicated that students' low achievement is a major issue in Mathematics education. This state of affairs has not pleased the Ministry of Education, Science, Vocational, Training and Early Education. The Ministry of Education, Science, Vocational, Training and Early Education through their document Educating Our Future (1996, p.25), observed that, "the overall unsatisfactory performance in the School Certificate Examination is attributed, to a large measure to poor performance in Mathematics."

Studies have shown that teachers exert enormous influence on students and thus determine to a very large extent their academic performance in mathematics. Some studies have found a correlation between teachers' attitude and students' interest in learning. Moreover, personality traits of the teachers are more powerful and influential than the course content or instructional strategies used in the classroom.

Attitude as a major determinant of a person's behaviour influences the way a teacher relates with the students and thus affects students' academic performance in Mathematics. This is according to

Johnson (2008) in a study on 'Teachers' Attitude as a Correlate of Students' Academic Performance in the UK, the classroom climate which is often times set by the teacher is determined by the teacher's attitude. A teacher's attitude to teaching will certainly affect his or her performance in the classroom. Attitude is about emotions and feelings, and effective teachers willingly share emotions and feelings (enthusiasm, affection, patience, sadness, disapproval) as well as a sincere interest and care about their student. According to Johnson (2008), most students complained of their poor performance in Mathematics because mathematics teachers were harsh, unfriendly, did not like being asked questions. If asked them a question, they would respond that what they were dealing with was simple and they just needed to use their brains.

Findings by Akinfe, Olofimiya, and Fashiky (2012) in their study on teacher characteristics as predictor of academic performance of students senior secondary in Osun State revealed that, students' academic performance in mathematics correlates positively and significantly depending on teachers' attitude to teaching and learning in the classroom; knowledge of subject matter and teaching skills. Furthermore, a study conducted on 'Students' perception towards teachers' attitude and its effect on students' performance in mathematics in Zambia' by Nonaka (2013) found out that students had an interest in learning mathematics. The interest was only affected by the way teachers conducted themselves in mathematics lessons. Pupils mentioned instances where a teacher was very fast and refused to answer their questions. Sometimes a teacher rebuked pupils who gave wrong answers especially the girls. The pupils gave the following statement "The teacher is harsh and not willing to answer questions we ask."

Performance in mathematics in many countries has been low. Unsuitable teaching methods have been viewed as possible factors responsible for dismal performance in Mathematics. The study by Jameel and Ali (2016) on Causes of Poor Performance in Mathematics from Teachers, Parents and Student's Perspective in Pakistan revealed that teachers used learning methods that learners did not easily understand and ultimately unable to follow the abstract theories when teaching

mathematics. Some of the methods teachers used to teach mathematics did not help students develop conceptual understanding of mathematics. Teachers needed to impart new knowledge in a clear and charming way by using multi audio and visual aids. Most of the mathematics teachers did not make the teaching of mathematics practical and exciting hence learners get bored as they are mere listeners and observers of the teaching of the subject in their classes and this leads to negative attitudes and ultimately low performance in mathematics by the students. Sakayombo (2018) alludes to the fact that teaching of mathematics in Africa has mostly through talk and chalk.

Tebabal and Kahssay (2011) in '*relationship between teaching method and students' performance in mathematics in public secondary schools in Dadaab sub county, Garissa county; Kenya*' was of the view that transferring knowledge requires teachers to use the appropriate method and pedagogy that best suits the learner and suit the objectives and desired outcomes. Most of the traditional methods are teacher- centered with no activity for the learners making them passive and therefore obtaining knowledge from the teacher without building their engagement level with the subject matter, the approach is least practical, more theoretical and memorizing. Student-centered approaches which are more effective are more encouraged because they embrace the concept of discovery learning.

According to Tebabal and Kahssay (2011), the poor academic performance by majority of the students in various subject areas is basically linked to the application of ineffective teaching methods by teachers to impact knowledge to learners and therefore teachers need to be conversant with numerous teaching strategies. Lasiwe (2009) in the effect of teaching strategy on students' performance in mathematics in Lusaka Secondary schools, found out that the poor academic performance by the majority students is fundamentally linked to application of ineffective teaching methods by teachers to impact knowledge to learners. Substantial research on the effectiveness of teaching methods indicates that the quality of teaching is often reflected by the achievements of learners. Sakayombo (2018) observes that the many

problems in mathematics education are related to the learners' perception of mathematics on one hand and, language deficit and their weak entry point on one hand and the teachers' ability to structure and sequence instructions in a given environment on the other hand. In order to bring desirable changes in students, teaching methods used by educators should be best for the subject matter.

As said earlier, there are many causes of poor performance in mathematics among senior secondary school students. Ashikhia (2010) identified teacher pupil ratio as one of the causes of high failure rate in Mathematics among students in India. Every formal education setting involves students-teacher relationship. The nomenclature of the teacher depends on the model of interaction. According to Davis and Hersh (2012) teacher can be described as a tutor if he gives private lessons to one student or as small group and he is directly paid by them. He is called a director if he gives instruction to the learners on how to go about the learning process. He is described as a monitor if he observes how the student is learning, and he is called a supervisor if he oversees the students learning activity. The nature of the subject also has a part to play in determining the effect of the teacher-student ratio.

Academic achievement is one of the leading goals and big challenge for an educational system in Zambia. According to Mulenga (2004), class-size and student-teacher ratio has a great impact on the quality of education and academic success of students. There is no doubt that pupil-teacher ratio and per-student outgoings are some of the important resource inputs for any academic institution. Lesser the ratio of student and teacher in the class better is the probability of improving the quality of education and accomplishing the academic goals of institutions. Quality of education is very crucial for strategic planning of academic goals and tag along with the pace of developed world.

The key to sustainable development, peace and stability within and among countries is the provision of education to the populace of such countries. Availability of teaching/learning



resources enhances the effectiveness of schools as these are basic things that can bring about good academic performance in the students (Wolfenson, 2000). NIED (2010) found out in Britain that the availability of textbooks produces gains in student learning. Textbooks contribute to a text-rich environment, increasing knowledge sharing among students. Textbooks improve learning for the poorest students by increasing motivation, performance and opportunity to learn. Textbooks are responsible for changes in educational practices such as assigning homework and increasing classroom reading time. Textbooks not only save teachers' planning time, but they also provide better learning experiences for students—including increasing active teaching and student-centred learning. Parents reported that teachers become better planners, while students are able to do assignments more easily, read on their own, and explore new knowledge. Textbooks also help parents support their children's learning at home. It is important to establish policies on the effective usage of textbooks, along with well-designed student and teacher support systems.

According to Mhlanga (2015) in Shortage of text books in Pretoria Primary schools found out that the learning environment for pupils has turned into that of struggling to access information. The shortage of textbooks has made it difficult for teachers to complete syllabi as they are often forced to move at a slower pace. This greatly affects Grade Seven pupils when they sit for their final exams. One Grade Seven teacher at another local school said the pupils rely mostly on the teacher and the chalkboard, which makes it difficult to progress fast. She added that if the syllabus is not completed there is no time for revisions, which must normally prepare pupils for examinations. Teachers are now experiencing an extra workload, as they have to transfer what is in the books. "We have swarms of work to write on the chalkboard." She explained that Grade One and Two pupils learn through seeing and experiencing the real thing and not through abstracts. "Children are now in blinkers, they only learn what they are taught which has crippled their education," she said. A survey carried out by Chronicle in local primary schools showed that most schools are facing a serious shortage of textbooks and teaching

resources, which makes the learning process difficult. Mismanagement of textbooks in schools has contributed to scarcity of textbooks in local schools.

Teaching is effective and efficient when students are taught the right content, having enough learning materials and high ratio of teachers' time on the teaching activity. Zulu (2016) in *Shortage of textbooks and crammed classrooms hampering education in Zambia* was of the view that students' performance in mathematics was not good at all as there were no enough teaching and learning materials. Generally, there had been low quality of schooling outcomes with over 66% failing in Mathematics only. Vudla, (2012) in Tshabalala and Ncube, (2013) was of the view that lack of fund to purchase necessary equipment, poor quality of textbooks, large classes, poorly motivated teachers, lack of laboratories and libraries, poorly coordinated supervisory activities, interference of the school system by the civil service, incessant transfers of teachers and principals, automatic promotions of pupils, the negative role of public examinations on the teaching learning process and inequality in education opportunities all hamper the smooth acquisition of mathematics knowledge.

## 2.2. Strategies to improve learner performance

Poor learner performance in mathematics seems to be a global problem. Improving mathematics and science education in the United States belongs near the top of the policymaking agenda. In order to avoid an over-reliance on the math and science talent of foreign students who are on high demand, the US policymakers and education leaders must ensure the U.S. education system is successfully preparing its students for careers in science and math. However, these ambitions are inhibited by poor performance in the two subjects. The Program for International Student Assessment (PISA) which administers a system of international assessments that measures 15-year-olds' capabilities in math and science literacy in 2003, was lower than the average performance for most OECD countries. Thus in order to address this problem, five strategies were put in place namely; to effectively assess student learning in math and science, strengthen teacher knowledge and skills in science and math, ensure

high-quality math and science teachers are available to the most disadvantaged students, ensure strong leadership from the higher education community, especially from university presidents and promote public awareness of the importance of math and science education to the country's future (Coble and Allen 2004). The OECD in its report of 2012, states that among the 34 OECD countries, the United States performed below average in 2012 in mathematics. Kafata & Mbetwa (2016) advanced factors such as motivation style, curriculum differences, parental involvement, time use, and adolescents' attitudes about how well they were doing in mathematics and how easy mathematics was for them as reasons why American students cannot perform as well as Asian students.

The state of mathematics in Australian schools raised concern among parents, educators, industry groups and governments as the country that was placed second on the United Nations' Human Development Index, declined on the global education rankings in the National Assessment Program – Literacy and Numeracy (NAPLAN), the Trends in International Mathematics and Science Study (TIMSS), and the Programme for International Student Assessment (PISA). Smith et al (2018) observed that if the trends remained unchecked, the country would risk a future without the specialised mathematical skills and the population-wide mathematical literacy that the nation requires and would also defy the ambitious objective of the Australian Education Act of 2013, which is "for Australia to be placed, by 2025, in the top five highest performing countries based on the performance of school students in reading, mathematics and science.

When a comparison was made between high and low performing schools was made, Smith et al (2018) discovered that holding professional learning communities (PLC), professional learning and developing conceptual understanding than procedural fluency was among practises in high performing schools. The influence of the teacher on the learner was seen as important hence the need for teachers to be provided with opportunities to discipline specific professional learning and access to numeracy coaches with expertise in mathematical pedagogy. The teachers' enthusiasm

can be achieved through professional development which is recognised by the STEM Partnerships Forum and the Commonwealth Science Council. STEM Partnerships Forum (2018) alludes to the fact that though it had recommended that a proportion of teacher professional development be dedicated to discipline-specific training, however, there is no jurisdiction in Australia that mandates discipline-specific professional development.

The Indian Government realisation of the importance of educational development provides required importance in education and thus created a multi-level structured education system prevails in India. The Indian Government has initiated several plans such as 'Sarva Siksha Abhiyan (SSA), District Primary Education Program (DPEP), Operation Blackboard, Mid Day Meal aimed to improve the level of primary education and to reduce illiteracy and makes plan and policy to address issues related to upper levels of education including secondary education. The national policy of education 1986 and program of action 1992 states that the curriculum of secondary education should expose the students to differentiated roles of science, the humanities, and social science. The policy documents also spell roles of teacher and infrastructure facility for effective education. While progress in education scenario is remarkable in India probably due to Government policy and programmes there some areas still require attention in the quality of secondary. (Das and Baruah, 2010)

Amongst the subjects taught in schools, mathematics is considered as one of the toughest subjects with poor performances of students. The lower level of pass percentage has been a matter of serious concern. Thus, science subject in general and mathematics in particular has been a problem area for majority of secondary schools in India. It is being often told that there exists phobia towards mathematics learning amongst the student communities of secondary schools. Das and Baruah (2010) observed that learner performance varied according to the economic status and management status the school. The interactions of a large number of socio-economic as well as academic environmental factors influence the student's performance in school. Poor school performance not only results in the child having a low self-

esteem, but also causes significant stress to the parents (Karande and Kulkarni, 2005). Identification of causes of poor performance and execution of corrective action plan so that the students can perform up to their full potential is required. Female low achievement rates are attributed to high mathematics anxiety. Another interesting finding of such study was that for the most capable students, test anxiety seems to act as a facilitator in their mathematics performance. The role of teachers has also been pointed out by the study stating that students' scores on the perception of their mathematics teachers have the strongest correlation with their mathematics anxiety scores. Teacher's quality supported by training and experiences has influencing role in effective teaching-learning. Thus, teaching experience plays important role in success of education.

Many countries in Africa have been making efforts to improve the quality of Mathematics and Science Education (MSE) at primary and secondary levels. However, a good number of these countries are faced with challenges in MSE including negative attitudes of students, teachers and parents towards MSE and low achievements of national examinations in MSE. When it comes to lesson delivery in the classroom, typical lessons observed in the classroom in many countries in Africa are lecture-type lessons where a teacher just explains concepts, demanding students to memorize facts and formulas and to give "chorus" answers with minimal activities carried out by students. It seemed that these kinds of lessons would not allow students to acquire scientific and mathematical thinking skills. (JICA2016)

Performance in mathematics among secondary school students in Somalia is as poor as in other countries. Abdulkadir (2010) intended to find out whether teacher characteristics, teaching methods, use of teaching resources and student attitudes towards mathematics affect students' performance in mathematics or not in a study conducted in Somalia. The study showed that 37.5% of the teachers felt that teaching methods played a major role in students' performance in mathematics. This is against the background were, the only methods of teaching mathematics were expository approaches leading to students' poor performance.

Additionally, methods of providing feedback to students were inadequate. The study recommended the ministry of education and umbrella groups should harmonize the policy of teaching mathematics by organizing in-service trainings for mathematics teachers with regard to teaching methods and use of teaching resources.

Teachers' self-efficacy and pedagogical content knowledge (PCK) are very important for the improved students' academic performance. Olanipekun and Aina (2014) recommended that for teachers to be effective, what is needed is for all teachers of all categories in Nigeria to be engaged in short- and long-term in-service training from developed countries. Umameh (2011) adds that the Mathematical Association of Nigeria (MAN) and Science Teachers Association of Nigeria (STAN) have as their cardinal objectives, to promote effective mathematical teaching and research and to keep in touch with developments in science and its application to industry and commerce and above all to popularise science respectively. However, the discontent at the incompetence of teachers has been getting louder and louder without any co-ordinated plan of attack. He posited teachers' incompetence results from the new curriculum which made them operate almost at the same level as their students as another contributing factor to the students' poor performance in mathematics. Olalekan (2010) adds that greater effort should be made to improve the quality of teachers at the high school level, and this also includes more professional development programs for the teachers so as to ensure they are up-to-date in their profession. Umameh (2011) recommended the encouragement of in-service training, regular activities in schools by professional bodies like STAN and Mathematics Association of Nigeria in addition to providing students with an opportunity to listen to experts, teachers from outside and arranging mathematical shows and exhibitions.

A study by Sa'ad et al (2014) on Causes of Poor Performance in Mathematics among Public Senior Secondary School Students in Azare Metropolis of Bauchi State, Nigeria found out that developing positive attitude, motivation and proper guidance toward mathematics, using proper methods of teaching the subject, provision of relevant teaching

materials, additional classrooms and furniture, provision of libraries and mathematical laboratories were some of the ways of improving performance in mathematics. The study recommended that frequent inter-school competition in mathematics, frequent supervision and inspection by proper authorities as well as enlightenment of parents on importance of children's education should be adopted.

Additionally, Fafasi and Yahya (2004) in their study on Strategies for improving the effectiveness of Mathematics Teachers at Secondary Schools in Nigeria observed that Poor achievement in mathematics was consistently being recorded at the West African Examination Council (WASCE) and Nigerian Examination Council examinations (NECO). Evidence from research reports indicated that mathematics teachers have a significant influence on the student's mathematics achievement. Some strategies highlighted to improve the effectiveness of mathematics teachers in secondary schools included incentive, adequate supervision by the Ministry of Education, provision of teaching aids, involvement in examination marking, and use of different methods of teaching were recommended. It was recommended that Mathematics teachers should be involved in WASCE and NECO items writing and marking exercises. This would assist the teachers to know the technicalities involved in testing and marking WASCE and NECO papers in mathematics. This would be achieved through well-coordinated workshops and seminars organized by these examination bodies. Being an examiner would enable the teachers to be more focused in teaching topics in mathematics and it would enable them to educate the students on how to answer questions.

The performance of students in mathematics among secondary schools in Kenya has remained poor for many years with an average score less than 20% (Kenya National Examination Council 2008). The reports also show that performance in Mathematics has remained low when compared to the other subjects offered in secondary schools. Gitaari et al (2013) conducted a study on the factors contributing to student poor performance in mathematics in public secondary schools in Tharaka south district, Kenya. The sample

comprised nine principals, nine HODs, 18 Mathematics teachers and 189 students. The study established that despite the implementation of Strengthening Mathematics and Science in Secondary Education (SMASSE) program in the district which aims to equip the mathematics teachers with suitable strategies which would aid in improving students' achievement in the subject, the performance in mathematics was below average. SMASSE and other seminars on the teaching and marking of mathematics are insets that provide the teachers with the required skills to teach and motivate learners. It was found that Teachers agreed that the SMASSE attendance boosts the quality of teaching and learning of mathematics. They observed that the formation of mathematics clubs in the schools, frequent in-service seminars and provision of adequate teachers would significantly improve the performance of students in mathematics. Recommendations conquer Sa'ad et al (2014) of the need for learners to participate in inter-school contests as inter-school discussions and science congress.

In a study by Maemeko et al (2017) on teachers' perceptions on the causes of poor academic performance of grade 12 learners in four selected schools in the Zambezi Region of Namibia showed that the grade 12 results had dropped from 18.3% in 2013 to 17.8% in 2016. Abdulganiyu (2010) and Usman, (2012) cited in Maemeko et al (2017) contended that provision of enough instructional media or materials, qualified teachers as well as conducive classrooms would assist a lot in improving the performance of secondary schools' students. Furthermore, learners would overcome their weaknesses in some learning styles if there are suitable training and learning strategies that would influence their learning achievements. Maemeko et al (2017) suggest that for schools to improve their grade 12 academic performance, extra lesson be conducted over the weekends and lecturers at the University of Namibia Katima Mulilo Campus should also be involved in order to improve on content presentation and that the effort of all the stakeholders is needed including learners, teachers, parents, and officials at the department of education.



Performance in mathematics at O-Level certificate in many countries has been poor and Zambia inclusive. Kafata & Mbetwa (2016) assessed the performance of the grade 12 students in Kitwe district of Zambia with respect to O-Level examinations in Mathematics and Science subjects in selected secondary schools of Kitwe District in the Copperbelt province of Zambia. A survey design was used in the study with a sample of One hundred and one (101) respondents comprising Sixteen Heads of Departments, Twenty-five Teachers of Mathematics and Science and Sixty Grade 12 pupils. Conclusion from the study indicated factors leading to poor performance in relation to mathematics included high teacher to pupil ratio, negative attitude by pupils towards mathematics and lack of teaching and learning materials. The study reviewed that the performance of mathematics as the major subject to the school of engineering was very poor and hence negatively impacted to the school of engineering as a student who fails mathematics at grade 12 O-Level examination cannot gain entry to school of engineering. The formation of mathematics and JETS clubs in the schools would be a great booster to the achievement of students in the subject and also encouraging pupils to join these clubs. Given that the research revealed that 36.36% teachers had a view that mathematics was naturally a difficult subject to pass, school administrators and heads of departments were tasked to encourage their members of staff to work hard and to develop positive attitude towards the subjects they teach. It called upon teachers of mathematics, school administrators, parents and all the stakeholders to get involved in the education of mathematics to pupils at secondary level of education.

In a study by Hakalo (2014) on factors contributing to girls' poor performance in mathematics in light of correctional measures taken at Sesheke secondary school established that in a bid to find themselves places in colleges and universities, more girls than boys who were once pupils at Sesheke secondary school and live in Sesheke, re-write mathematics as GCE candidates than they do in other subjects, an indication that girls do not do well in mathematics at Sesheke Secondary School at grade 12 level. Using a qualitative research approach, questionnaires were

given to selected fifty girls and twenty-five parents who were sampled purposively, Lesson observations were conducted on four teachers. Focus group discussions were conducted one with eight teachers while the other one with twelve girls. The findings revealed that girls were less active in class and developed a negative attitude towards mathematics as the teachers seemed to pay more attention to the boys who were better performers. In order to improve teaching and learning practices at Sesheke secondary school, the study recommends that the school management sensitize mathematics teachers not to be gender biased when teaching. Teachers were encouraged to present to girls' scientific theories that suggest that mathematics performance is the result of experience and not genetics as well as guidance teachers need to work in collaboration with teachers of mathematics and the school head teacher to provide girls with many efficacy-building experiences in mathematics.

### **2.3 Role of professional associations in learner performance.**

When teachers have a firm foundation of content knowledge and mastery of effective instructional skills, students are very likely to achieve at high levels. Rick (2003) states that teacher content knowledge and instructional skills play a critical role in improving students' academic achievement and that there is need for teachers to balance teaching applications in their lessons plans with technological information that evolves from the wider learning community such as a professional learning community. A professional learning community is defined by Stoll and Louis (2007) in Smith et al (2018) as cohesive group of teachers with a focus on professional learning and improving their collective knowledge. Professional learning communities can be subject specific or have a broader focus.

The role of PLC is cardinal in any learning institution as Rick and Mattos (2013) observed that most powerful strategy for improving both teaching and learning is not by micromanaging teachers but by creating the collaborative culture and collective responsibility of a professional learning community (PLC). Rick and Mattos (2013) view teacher quality as one of the most significant factors in student

learning. Vescio et al (2008) attest that “student learning increases when teachers participate in professional learning communities”. Educators in schools that have embraced PLCs are more likely to not only take collective responsibility for student learning, help students achieve at higher levels, and express higher levels of professional satisfaction, but also share teaching practices, make results transparent, engage in critical conversations about improving instruction, and institutionalize continual improvement.

A study conducted by Woodcock (2014) in the United Kingdom on *Subject Associations Round-Up* brings to light that the Association of Teachers of Mathematics (ATM) can help through its high-quality publications, its stimulating journal and vibrant community of teachers. The new National Curriculum for mathematics includes conceptual understanding, mathematical reasoning and problem solving in its aims. These have always been important as they resonate closely with using and applying mathematics. Working scientifically in the new programs of study for science reiterates the need for children to apply their mathematical knowledge to their understanding of science.

A study conducted by Ontario College of Teachers (2006), entitled *Subject Associations* outlined different subject associations and their functions. The study found out that Subject associations play a vital role in education. They offer conferences, workshops, newsletters and an array of learning resources. The associations publish journals, attend ministry meetings and provide teachers with news and information about the curriculum related to their subject areas. Among associations in Ontario are AFÉSEO, ARTSECO, and OAME. AFÉSEO is an organization for anyone who is interested in early childhood education in Ontario. It is attuned to its members’ needs and supports them in their educational role with young children. AFÉSEO’s objectives are to promote communication and the exchange of information, provide training and resources and advocate with various authorities to respond to early childhood needs.

Arts Education Consultants of Ontario (ARTSECO) is comprised of arts consultants and

coordinators from across the province. Its mission is to encourage and support the development of the arts in education and the implementation of the arts curriculum in all Ontario schools. ARTSECO liaises with the Ministry of Education, as well as existing agencies and arts organizations to support arts education in schools. Ontario Association for Mathematics Education (OAME) OAME is the professional organization for everyone interested in Mathematics education in Ontario. The organization’s mission is to promote excellence in mathematics education in the province.

According to Woodcock (2014), the Historical Association is working hard to ensure that members’ needs are supported with the changes to the new curriculum. The Historical Association has responded to the history teaching challenge with a wide range of initiatives to support the subject cross over and the changes in the new primary curriculum. There is history in every curriculum subject, including science. In key stage 1, pupils are asked to study significant individuals. These people may have made significant contributions to science and technology, or be some of the named individuals from the science curriculum. In key stage 2, students are required to undertake a chronological unit that develops their chronological understanding. There is nothing to stop this tracing a theme like science or technology over time, or picking a specific turning point such as the Industrial Revolution. The association is also developing partnerships with other subject associations to work together to support members, including a conference for English and history subject specialists to re-examine their teaching of the First World War. The association can offer help and advice with the curriculum cross over through its articles, resources, podcasts, lesson plans, and schemes of work and topic and curriculum guides. Already in development are units of work linked to English and Mathematics and future plans include units of work with links to science. History association works with other associations to offer help and advice to other associations because there is history in every subject including science

The International Council of Associations for Science Education (ICASE) was created in 1972 by the United Nations Educational, Scientific and

Cultural Organization (UNESCO) to extend and improve science education throughout the world. ICASE is a vast network of science teacher associations, institutions, foundations and companies, working together to promote science and technology education. ICASE operates internationally and includes member associations and organisations from around the world. ICASE facilitates communication and cooperation at national, regional, and international levels. Since it is difficult to bring teachers together for conferences and discussions on an international scale due to travel costs and accommodation expenses, ICASE has worked on developing networking opportunities through regional and world-wide projects as well as newsletters and publications that bring experiences from many countries to the attention of science teachers at the local, regional and international level. ICASE has produced a range of publications, in addition to the Journals and newsletters, including conference and seminar reports, resource notes for teachers, a series of commemorative issues, research papers and a yearbook (ICASE 2019).

Founded in 1944, the Virginia-based National Science Teachers Association (NSTA) promotes excellence and innovation in science teaching and learning for all. Its membership includes science teachers, science supervisors, informal science educators, administrators, scientists, and leaders in business, industry, and government and it along with its members. It works with 165 student chapters to further promote and support quality science education. Its focus has been on teachers, schools, and districts, providing support from the ground up by way of face-to-face professional learning; publications filled with pedagogical tips, science content, and classroom activities; and opportunities to recognise student and teacher achievement. NSTA seeks to raise the status of science education and science teaching as a profession by advocating for high-quality science education; enhancing the professional learning of science educators by providing a suite of tools, resources, and opportunities that support long-term growth; revitalising science education to boost student achievement and science literacy; and nurturing scientific curiosity among children in the earliest grades. NSTA works to engage teachers of science

nationwide and improve student learning by providing professional learning products, services, and programs. Through its learning centre, educators can explore content and its pedagogical implications and document their professional growth. NSTA works with various organisations to advocate for science education at the national, state, and local level. (NSTA 2017).

The association also helps to engage teachers in advocacy; co-sponsor events such as the March for Science; provide resources and guides to engage parents in supporting their child's science learning; and frequently provide perspective and insights to news outlets. Teachers are also trained to be ambassadors for Science, Technology, Engineering and Mathematics education (STEM) and work with elected officials at all levels. And while the creativity that drives STEM literacy, scientific discovery, engineering design, technological problem solving, and innovation starts at home, it is nurtured in the K-12 primary and secondary education STEM classroom. STEM experiences help students develop critical-thinking skills, encourage innovative thinking, and foster perseverance. Students need the kind of preparation that not only supports their learning now, but also gives them the tools and skills necessary to succeed in a continuously changing world. STEM education gives them these skills.

NSTA provides professional learning and resources a science educator needs, teaching resources, discounts to online face-to-face professional learning opportunities, skill-building webinars. NSTA hosts annual national conference, STEM forum and expo that offer the latest in STEM content, teaching strategies, and research. NSTA also hosts Professional Learning Institutes (PLIs), that address topics in depth and promote research-based strategies to improving science education and help participants learn how to conduct comprehensive teacher training on the Next Generation Science Standards (NGSS). NSTA acknowledges that the biggest challenge to STEM education is the low level of science literacy in the general population hence, NSTA publishes books for science teachers and for children with accompanying guidance for both parents and teachers. Further, the NSTA publishes five peer-

reviewed journals, four in print and one online (NSTA 2017).

The Nigerian government has clearly confirmed the importance of mathematics by making it a core and compulsory subject at both junior and senior secondary levels (Federal Republic of Nigeria [FRN], 2004). Umar et al (2014) stated that the government recognised the importance of mathematics in science and technology and in fact in all areas of human knowledge hence, established the National Mathematical Centre and had been funding it as one of its parastatals. It was also observed that the Mathematics Association of Nigeria was doing a lot in the area of promoting effective mathematical teaching and research. However, the invested billions of Naira in the teaching and learning of mathematics has not yielded any significant improvement. Makinde (2012) observed that student performance in mathematics in both internal and external examinations in Nigeria has revealed a high failure rate.

According to Mkpa (2009), subject associations have influence on the curriculum of Nigerian schools at different educational levels. In most of the subject areas, experts and teachers come together primarily to contribute to the advancement of knowledge and teaching in the subject. Examples of such subject associations include the Mathematics Association of Nigeria (MAN), the Historical Association of Nigeria (HAN), the Science Teachers Association of Nigeria (STAN), Social studies Association of Nigeria (SOSAN), and Society for Promotion of Igbo Language and Culture. Other groups exist to represent the interest of various other subjects. In the field of education, there is Curriculum organization of Nigeria (CON), Philosophy of Education Association of Nigeria, Nigeria psychological Association and others. Most of these associations have identical goals, they can play significant role in the evolution of the curriculum especially when they are properly organized on courses. This is so because most of the associations are either textbook author researchers who generate new knowledge in the various area as many are classroom teachers who actually implement the curriculum when it is planned. One interesting and commendable feature of many of the

subject association is the openness of their membership opportunities. The memberships are extended to all associated within the subject course at all levels of education, to become members and contribute effectively towards the development or implementation of any aspect of the curriculum related to the subject.

Though there are a few South African discipline-based professional associations that bring teachers together on a voluntary basis from across the profession, to focus on improving professional practices and standards De clercq (2013) observes that The Association of Mathematics Educators of South Africa (AMESA) or the Southern African Association for Research in Maths, Science and Technology Education (SAARMSTE) are such independent discipline-based professional associations, which emerged organically, and emphasise the value of teacher collaboration and networks and the improvement of teachers' professionalism and school education for all. AMESA declares its commitment encouraging its members to strive towards a high standard of professionalism promoting and disseminating research related to mathematics education, formulating policy statements on matters regarding Mathematics Education and promoting of such perspectives among its members, engaging actively in mathematics education projects that will result in the social, economic, political and cultural development of society. SAARMSTE has chapters which connect its members and promote a supportive environment for practitioners to undertake research, to reflect and improve on their practice. These independent associations are led by university-based professional educators and use experts to assist with their professional developmental activities and have taken teacher professionalism needs as a matter of priority. This is being achieved partly through the development of teacher professional knowledge and competences, but also through subjective constitutive processes which improve teacher professional identity, mind-set, behaviour and values

The Home Economics Association of Zambia (HEAZ) was formed in 1973 to look into the challenges of teaching and lecturing Home economics and find solutions. Ndopu (2009)



observes that the biggest role that Professional Associations had played in the Continuing Professional Development of teachers in Zambia, in this case, the Home Economics Association of Zambia (HEAZ) was that it had helped teachers of Home Economics in various ways, among them, the sharing of information and knowledge, updating their teaching methods and how to conduct credible examination. The knowledge and skills acquired would also enable the teachers to be handle home economics lessons more effectively. Furthermore, HEAZ provided a platform through which teachers would acquire new knowledge and skills to cope with the changes within the curriculum and global trends.

According to Masendeke (2015) Junior Engineers, Technicians and Scientists (JETS) has been running for an impressive fifty-one years in Zambia. The association was started by a group of eminent scientists in 1968 during a Zambia Association for Science Education (ZASE) meeting. During this history making meeting, the scientists seized the opportunity to co-ordinate school science clubs through a formal organization that they decided to call JETS. The idea behind this association was to popularize science and mathematics in schools. The JETS mission is: To promote the production and display of high quality scientific and mathematical projects that provide solutions to local problems. JETS is all about providing young people with a better foundation in science and mathematics and giving youths an opportunity to learn and apply scientific principles in the design and construction of scientific and technical items. These objectives are being met through the ever-popular JETS fairs promoted by many schools.

## III. RESEARCH METHODOLOGY

### 3.1 Research design

In this research, a descriptive case study design was adopted so as to bring out the views of the respondents. A descriptive research is useful because it can provide important information regarding the average member of a group. Gray (2009) states that case studies can prove invaluable in adding to understanding, extending experience and increasing conviction about a study. A case

study helps to understand a given phenomenon from the few examples that are selected.

### 3.2 Sampling procedure

In this study, simple random sampling was used to select six secondary schools from which respondents, were drawn and was also used to select the thirty-seven teachers. Purposive sampling was used to select the thirty-five teachers of mathematics, six guidance and counselling teachers, six Heads of Mathematics Departments and six Head teacher, five members of the ZAME district executive committee.

### 3.3 Target populations and Sample size

The study targeted all teachers of mathematics, Guidance and counselling teachers, Heads of Mathematics Departments, Head teachers in the secondary schools of Kabwe, and ZAME Kabwe District Executive officers. The sample consisted of fifty-seven respondents which comprise of thirty-five teachers of mathematics, six guidance and counselling teachers, six Heads of Mathematics Departments and six head teachers, five ZAME District Executive officers.

### 3.4 Instruments of data collection

In collecting data for this research, questionnaires were administered to all the respondents in the study.

### 3.5 Procedure for data collection

The researcher obtained an introductory letter from Information and Communication University and a permit letter from Kabwe District Education Board Secretary (DEBS). The researcher then proceeded to make appointments with the head teachers of the selected secondary schools. The questionnaires were then administered to the respondents and the researcher endeavoured to adhere to the dates of appointment.

### 3.6 Data analysis techniques

According to Kothari (2004), data analysis is a process of editing, coding, classification and tabulation of collected data. Sidhu (2006) states that analysis of data means studying the tabulated

materials in order to determine inherent facts or meaning. It involves breaking down existing complex factors into simpler parts and putting the parts together in new arrangements for the purpose of interpretations. The data from the questionnaires was analysed by coding and grouping into emerging themes. Excel was used to analyse quantitative data.

### 3.7 Ethical consideration

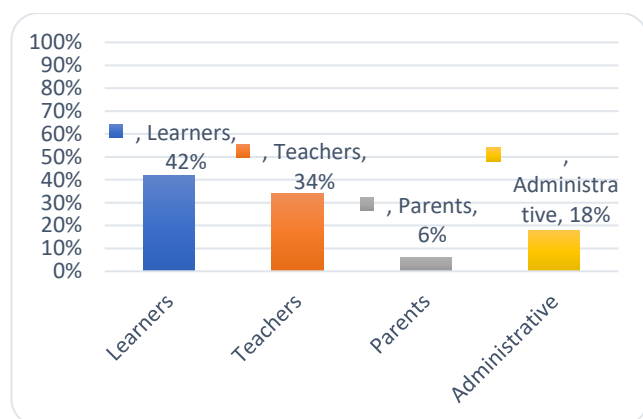
Ethical considerations play a significant role in the credibility of a research and its findings, therefore the researcher sought permission from the gate keepers of the sites, informed consent from the respondents and also ensured confidentiality during and after the research process.

## IV. FINDINGS AND DISCUSSION

### 4.1 Causes of poor learner performance in mathematics

The findings brought to light causes that were either attributed to the learners, teachers, parents or administration. The figure below shows that 42 % of the causes were attribute to learners while 34 % were attribute to teachers, 6 % attributed to parents and 18% to being administrative.

**Figure 4: Causes of poor learner performance.**



**Source: Field Data 2019.**

Head teachers, HODs, teachers, guidance and counselling teachers and ZAME representatives all identified the learners' negative attitude towards mathematics as a major contributor to low learner performance. Others simply fear the subject and they regard mathematics to be too difficult.

Guidance and counselling teachers added that the problem of negative attitude was more among the female learners.

All respondents were of the view that the learners had poor mathematical foundation either from the junior level or primary level. This meant that it was difficult for the learners to adequately comprehend subsequent topics that they needed to learn at senior level as they lacked the basic foundation. As Sidhu (2008) observes that clear understanding of fundamentals can build a solid foundation for mathematical learning. As learning is from the known to the unknown, pre-requisite knowledge becomes cardinal to understand more complex concepts or principals.

The ability to read and comprehend any written text is cardinal for meaningful learning to take place. The heads of departments observed among challenges that the literacy levels were very low among the learners hence it was a challenge for them to read for understanding and solve subsequent question based on the given information.

Head teachers also brought up the issue of lack of confidence by the learners. This means that learners do not believe in themselves as having the capacity to perform better. They doubt their abilities to be high achieves in mathematics hence. They give up easily. For one to be excel, they need to put in place a study time table catering for all subjects that one is studying. ZAME representatives observed that the learners had poor study skills. It was observed that the learners do not take mathematics seriously and hardly study the subject. The learners do not practise or regularly through what they learn so as to master the skills, knowledge and concepts. Furthermore, it was noted that some learners are over dependent on exam leakages. Learner do not study with the hope that they will access exam leakages prior to the exams. This means that the learners just master the concepts not for understanding but just to pass the exams. Muchena and Funke (2015) put forward that students' desire to pass exams, fear of getting low marks and lack of confidence is responsible for examination malpractice. Candidates believe they cannot pass their exams without some external

assistance thus; candidates will try to acquire exam leakages by all means.

The use of calculators in grades 10 and 11 makes the learners become over dependant on the calculator even for easy calculation. This was seen as an impediment to learners' performance as dependency on calculator does not enhance the learners' cognitive skills. Learners were at a loss when it came to answering the grade 12 mathematics paper one, where use of calculators is not allowed. Thus, their performance in paper 1 is lower than that of paper 2.

It was also observed that absenteeism by learners makes them lose out on quality school time and hence loss out on what was covered in their absence. And without checking with friends coupled with poor study skills, learners lose out and miss out on a lot of work. However, it was not established whether learners are absent for the whole day missing all lesson or opt to shun mathematics lessons.

The respondents observed that some teachers just as the learners, had a negative attitude towards the subject despite them being teachers of mathematics. One can only perform to their best of they have interest in what they are teaching hence. May be some teachers trained in mathematics just to have a job. It can be said that their negative attitude would lead to the learners losing interest in the subject as well. Lack of interest on the part of the teacher can affect the way their deliver their lesson. Some teachers lacked the enthusiasm to draw the learners' attention. They taught the subject with very low drive and the learners were subsequently bored thus losing interest not only in the subject but the presenter as well.

The methods used by some teachers were seen also no to be ideal. Some methodologies were just 'talk and chalk' (lecture method). The teaching methods were not learner centred such that the learners would be able to draw conclusions on their own. Learners need to be actively engaged in the learning of mathematics rather than just being listeners and observers of the teaching of the subject in their classes. The methods used by some teachers did develop the skill of critical thinking on the part

of the learners. As Lasiwe (2009) observed that the poor academic performance by the majority students is fundamentally linked to application of ineffective teaching methods by teachers to impart knowledge to learners. Teaching method used to teach mathematics should be those that develop learners' critical thinking, understanding and retention of the learnt concepts. Additionally, it was observed that mathematics is taught in abstract. Teachers fail to make the subject meaningful to the learners as some teachers do not refer to real life applications or examples. Thus, the learners are not able to relate the learnt concepts to what surround them in their immediate environment.

Some teachers rushed the learners through the topics for the sake of finishing the syllabus. Thus, the learners were not given enough time to digest and assimilate what they had learnt. With little practise, it implies that the learners would enter the exams with scanty or little knowledge on the topics they had covered at senior level. The respondents also observed that some teachers did not teach some topics such as symmetry, transformation, computers in mathematics and others. If taught, not all the concepts were adequately covered as expected. In short, teachers were not competent to teach some topics hence, to a large extent had denied learners the opportunity to learn topics which they may have easily understood. Furthermore, the implication for untaught topics or selective teaching of topics, would be that some teachers had selected the topics which learners would answer especially in Section B of Mathematics paper II. This disadvantaged the learners on the range of topics which they would be able to answer. Due to the challenges of competence some teachers were failing to teach the same class from grade 10 to 12. Guidance and counselling teachers added that learners felt that some teachers were not competent to handle senior classes. Other teachers do not allow learners to ask questions. Question are asked to seek clarity hence understanding what is being thought, but when teachers do not allow questions, slow learners are left behind and misconceptions are not immediately corrected.

A consumer is enticed to buy an item based on how well it is promoted by the sales person.

Teachers of mathematics in the same vein need to market the subject for learners to buy into it. The learners should be able to see the benefits of studying the subject not just for classroom practise but entry requirements for tertiary education and day to day use in life. Some teachers were not marketing the subject enough for the learners to like mathematics. The learners were not helped to appreciate the subject, hence saw no need of studying a subject which was seemingly difficult to them and mentally taxing.

In some cases, learners were not availed with homework so that they could practise more. If it was given, it was not enough to give them adequate practise and, in a way, to help improve their study skills. Some teachers despite handling exam classes, did not an extra mile to ensure learners obtain good grades in mathematics. Learners were not given remedial work or given extra lessons to ensure all the slow learners were brought on board or so as to ensure all topics were covered. Not conducting remedial work meant a build-up of topics and concepts that were not understood by the learners. Thus, the learners would eventually write the final exams without understanding most of the topics covered. Additionally, not conducting remedial work meant learners were deprived of the pre-requisite knowledge needed for subsequent topics.

It was also observed that teachers did not exposed the learners to questions according to examination standards early enough. Doing so would have enabled the learners appreciated how questions in various topic are phrased and areas of focus and to a large extent given the learners enough practise. Learners could have been used to a different questioning technique such that at the time of writing the final exams the nature and phrasing of questions in the final exams appeared alien to them. Though learners complained that they perform badly because some questions are awarded very low marks despite the question requiring a lot of where more calculation having prior knowledge about examinations standards would have helped them appreciate the various levels of competence that examiners seek for each given question.

The education leaders felt that another contributing factor to the low performance by the learners, was the absenteeism by the teachers. Being way from duty meant that contact time was lost between the teacher and the learners and catching up this lost time was not done or when done it was not adequately done. When teachers tried to make arrangements to catch up after the normal lessons, this was not effective as learners were already tired by that time. Furthermore, when teachers made arrangements to teach over the weekend, not all learners would attend these lessons as they were had other commitments.

Findings revealed that learners' performance was affected as some parents were not involved in their children's school affairs. While it may be appreciated that not all parents could have been learned or well vest in the subject, it was expected that they would show commitment either by signing the learners work or making regular visits to the school to inquire about the performance of their child. Parents were not monitoring the learners' performance. Those that monitored did not make serious follow ups to try and seek remedy for their child's low performance. The teachers and parents were not seen to be offering the same counsel to the learners so that the learners would appreciate that both the school and their parents had their best interest and both desired that they put in their best.

Additionally, other social factors and home background were seen to have affected the learners' perception and subsequent performance in mathematics. Parents dislike or negative comments about mathematics was seen as having an adverse impact on the children and hence changing their perception when learners came to school proved to be problematic. As Mata (2012) posit parents' positive support helps students develop positive attitudes about the social importance of mathematics.

The respondents were of the view that the low staffing levels greatly impacted on the performance of the learners. Low staffing levels in the mathematics department meant that teachers would have high loads. The high loads would eventually compromise on the quality of lesson delivery. Absenteeism by teachers through permission or



otherwise meant even higher loads for those presents as they try to ensure that no class losses out on learning.

While there could be administrative reasons for changing teachers teaching in a given grade, this was brought up as contributing to low learner performance. Each teacher has their individual strength and teaching strategies. Thus, if a class that was handed by an effective teacher who had a good relation with the learners, teaching enthusiastically carrying all learners on board, was given to a teacher that did not much to the characteristics of their previous teacher, their attitude towards the subject could be affected negatively. The effect is worse if there are too many changes within a short period of time.

Teaching and learning materials are cardinal to enhance the quality of teaching and learning. These should also be in adequate supply and readily available. Lack of the necessary teaching and learning materials was seen to contribute towards low performance by the teachers. There was a lack of text books for learners, teachers' reference books and guides and mathematical apparatus hence impeding smooth delivery of lessons. With the right books, teachers are guided on the right content to teach and teaching becomes more effective and efficient. Learners were not availed with text books for personal study, research or refer to when doing homework due to none availability or very few text books. Tshabala and Ncube, (2013) and Zulu (2016) also observe that learners' performance in mathematics was not good as there were no enough teaching and learning materials

The teachers observed that the syllabus was too bulky and hence was proving to be a challenge to finish teaching all the topics within the stipulated time. The re-alignment of topics in the revised curriculum had caused problems not only to the learners but teachers as well. In the revised curriculum, mathematics lessons have been allocated four hours which is six periods from the previous seven periods in the old curriculum. The respondents also observed that there was poor policy on continuous assessment. This could have meant that there was need to strengthen the policy at school level for every assessment given were

both the learners and teachers would be held accountable for the results.

The results show that most of the causes were attributed to the learners at 42% as shown in figure 4, implying that the learners were being held more accountable for their own learning. In terms of ranking, learners were followed by teachers at 34%. Teachers as curriculum implementers have a big role to play in ensuring effective teaching and learning takes place. Attributes attached to administration either at school level of higher levels in the ministry of education was at 18% while the parents were only at 6%. As Weiner (2000) postulates that a central assumption of the attribution theory is that people attempt to maintain a positive self-image, hence given the poor results, rather than shoulder the blame, teachers directed most of the blame to the learners for the low performance in mathematics. This was seen in the finding were the respondents attributed the poor performance to the learners. Vlachou et al (2014) observed that teachers are likely to attribute poor performance more to factors internal to the student, especially to limited ability, followed by low student effort or motivation. However, there is need for teachers to make a self-evaluation and adjust accordingly.

## 4.2 Strategies employed by school to improve learner performance in mathematics.

Professional development was employed as a way of improving learner performance. School based departmental continuous development meetings (SBCPD) were being strengthened and all members were encouraged to attend so as to share the best experiences and teaching methods to ensure quality lesson delivery and ultimate learners' performance. As observed by Mumba and Hama (2014) that the lesson study impact survey revealed that schools that were active in the practise recorded better results not only in science but mathematics as well. However, over the years teachers lost the passion in the practise of lesson study and the results began to go down. They concluded they concluded that CPD activities and lesson study in particular were an avenue through which teachers would increase their competence in teaching, build confidence and reduce anxiety. Thus, it was

significant for teachers to engage in meaningful CPD activities that would eventually yield the desired results in terms of lesson delivery and learner performance.

The management and heads of department intensified monitoring of teachers not only by observing the lessons but also ensuring teachers were committed and covered the schemes of work as planned. Where a teacher was lacking or felt incompetent to handle a topic, co teaching was introduced so that learners do not loss out and at the same time the teacher with a deficiency would learn from the other. Arising for the reduced number of periods in the new curriculum, some schools had opted to increase the number of periods for mathematics so as to create more time to adequately cover the syllabus. This had also been achieved by providing holiday tuition especially to the exam classes. Others mentioned that for grade 12 classes, teaching was done in the first and second term so that third term would be reserved specifically for intensive revision and attending to individual needs of the learners.

Regular assessments were increased so as to give the learners more practise and room to correct any misconceptions. There were variations on how assessments were being done: from weekly tests, fortnight tests or monthly tests or homework. The home work policy had also been intensified with learners being assigned to study groups, where they could work collectively and help each other as peers. These groups are being used specially to revise each topic using past exam questions. It was hoped that regular home task given to learners helped to develop self-efficacy and sense of mastery.

The teachers tried ensure that the continuous assessments comprised questions that were of the Examinations Council of Zambia standard. Increased assessment has been occupied with regular analysis of results in order to promote not only accountability on the part of teachers but also to instil a spirit of hard work as learners. Where learners are engaged in results analysis, they are able to keep truck of their progression and see how much they need to put in.

Some respondents revealed that they had started repeat program for non- performing pupils. These were however pupils who not only performed poorly in mathematics but whose overall performance in all the subjects was low and if allowed to continue. There was a concern that if allowed to progress with the low performance, they would ultimately fail in most if not all the subjects in the final exams. Thus, to an extent the thought or repenting a grade would force the learners to work hard in mathematics and other subjects as well.

While none performers were made to repeat, those that were excelling were being rewarded accordingly. Apolline (2015) reveals that motivation is significant in the teaching-learning process and is positively related to the teaching-learning process. Schunk (2000) defines motivation as the force that initiates, guides and maintains goal-oriented actions or behaviours. It is what drives individuals to act, get into a university to earn a degree. Motivation is the process of arousing, directing and maintaining behaviour towards particular goals. Acheck (2015) posits that good teachers are sensitive to students' motivational needs and so try to create a climate that supports the development of the learning community. Awards were given to learners who had got grades 1 to 3 (distinction to upper merit) and as such deserving learners are motivated to continue with the good performance while the other pupils are motivated to try harder. Thus, motivation is an important factor in education especially in the administration of school staff and the teaching and learning process and a pivotal role in learning.

Establishing mathematics clubs is one thing and ensuring it is effective is another. Teachers were trying to ensure that club meeting were effective by conducting remedial lessons for challenging topics, quiz and making the meetings relevant to the needs of the learners. Learner from various grades were encouraged to join the clubs and participate by presenting lessons or simple methods of solving problems. When learner make presentations, other are encouraged and motivated hence develop a positive attitude towards the subject as they see that they also have the potential of performing better in mathematics.

Given that some learners had poor study skills or may be their home environments were not conducive for serious study afternoon prep was conducted in order for learners to study. Other schools would conduct guided prep were teachers would keep the learners engaged by revising past exam question papers. By doing so to was hoped that learners would get exposed to exam questions and discover how to best solve the question as the sessions would be conducted through discussion.

Over dependency on calculators was seen as a great impediment towards learner performance and as such teachers decided to start exposing the grade 10 and 11 pupils to paper one type of questions during tests so that they would develop the competence of working without calculators. This would also help to prepare the learners to be able to attempt the grade 12 paper 1 more comfortably and competently.

Marking of class and period registers was intensified so as to curd absenteeism. Learners that were absent without valid reasons were not only reprimanded but also punished. The education leaders pointed out that they had started the procurement of more text books, reference books and other materials for the mathematics department. This was being done to beef up the stock and ensure learners also had access to text books where they could read material in print other that depending on what was written on the board by the teachers.

### **4.3 Challenges faced by ZAME to enhance learner performance in mathematics.**

The Zambia Association of Mathematics Education (ZAME) welcomes teachers and other educators of mathematics from primary, basic, secondary, college and university and any other persons interested in Mathematics and related disciplines to join the association. However, the ZAME constitution of 2018 is alive the fact that for one or an institution to be recognised to be its member, one should have paid subscription fee for that year. Hence only fully paid-up members are deemed to be members of the association.

Among the head teachers, only three were specialised in teaching mathematics. One had specialised in social science and the other in social

science and languages. The other did not give a response. Those specialised in mathematics had a representation of 50%. Among the head teachers, only one was a member of ZAME while the other two were not members. This translated into 33% for members and 67% for none members.

Among the HODs, all except one said they belonged to ZAME. Those who were members were at 83% in comparison to the one who was not a member at only 17% This meant a larger percentage of the HODs were members of the mathematics association and them being members would serve as an example to the other teachers in the department.

The teachers had a representation of 57% for members and 43% for none members. The number of those who were not members (fifteen) was very close to the number of members (twenty). This meant that there was almost an equal number of members and none members of ZAME in the district. How then were these other teachers to benefit from the association if they were not members?

All ZAME district executive members were members of the association. It is a requirement that those aspiring to be in the executive should be fully paid-up members. The total number of mathematics teachers in the study was forty-nine. This included three head teachers, six heads of department, thirty-five teachers of mathematics and the five ZAME district executive members. Out of the forty-nine, thirty-one were members while eighteen were not members. This meant that at the time of conducting the research, the eighteen teachers had not paid their membership fee or had not yet affiliated to the association. As shown in table below that 63% were members while 37% were no members. This tallies with findings by MOE (2002) that there was low membership in ZAME despite majority of teachers identifying themselves with the association.

**Table 1: Summary of teachers' membership in ZAME**

Category	Frequency	Percentage
Yes	31	63%
No	18	37%
Total	49	100%

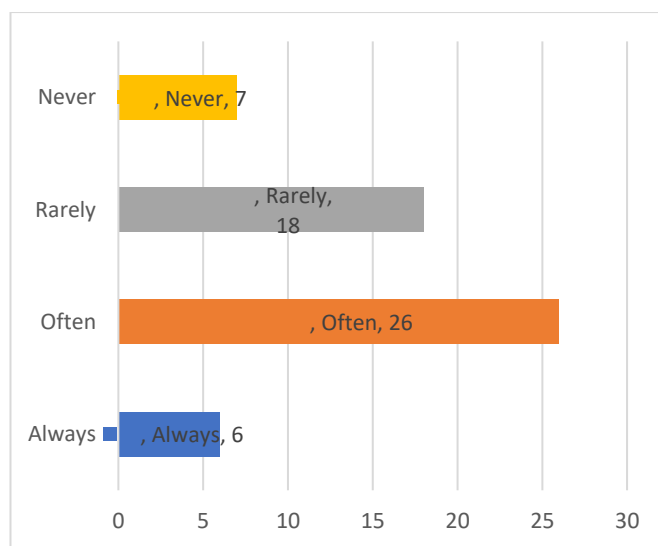
**Source: Field Data 2019.**

A total of eleven respondents had been members of ZAME for less than five years. This included one HOD, eight teachers and two members of the ZAME district executive committee. Fifteen had been members for a period range of 6-10 years. These comprised of one head teacher, two HODs, nine teachers, and three ZAME district executive members. Among the thirteen who had been members for over ten years included two head teachers, four HODs and seven teachers. However, eleven teachers did not respond to the question. The period range 6-10 years had the highest number of respondents at 39% in term of the period in which the respondents had been members of the association. The variations arising from the total number who said they were members (forty-nine) and total number (thirty-nine) who had been in ZAME for various periods of time may be attributed to the fact that teachers were no consistent with the yearly subscriptions.

Only two guidance teachers stated that teachers attended zonal meetings. Forty-two respondents cited district meetings which comprised six head teachers, six HODs, twenty-three teachers, four guidance teachers and two ZAME district executive members. Five head teachers, six HODs, eight teachers, twenty-three teachers, guidance teachers and two ZAME district executive members mentioned provincial workshops. Among the respondents, only one HOD and one ZAME district executive members mentioned national conferences. Three teachers stated that teachers had attended none of the meetings. This implies that district meetings were the mostly attended meetings as they were local as these were held locally and did not require a lot of allowances for the participants. Though provincial meeting was cited, the response

was much lower than those that indicated district as the most attended meetings. This could be that schools sent more teachers for local meetings as provincial meetings that were usually held out of town would require allowances such as transport and subsistence allowance. With the problem of finances in the school only very few teachers could have been sent for provincial meetings. Thus, with the low attendance, ZAME needed to create meetings at zonal levels were a few schools would be involved.

**Figure 5: Frequency of attending ZAME activities at various levels**



**Source: Field Data 2019.**

The finding on how often ZAME activities were attended at various levels indicate that 10.5 % said “always”, 45.6 % said “often”, 31.5 % said “rarely” and 12% said “never. From the school set-up, only the head and HODs stated that the meetings were attended always. None of the teacher said always. This could be attributed to the fact while those in management have representation at these meetings. Most of the teachers either said they rarely or never attended the meetings. This meant that they were not guaranteed to attend the subject association meetings. Furthermore, given the number of teachers in the department, the HODs may have been rotating the teachers to attend meetings. This implies that a relatively high percentage of teachers did not attend ZAME meetings regularly.



The ZAME DEC members observed that financial resources were the major impediment faced by the association to carry out its operations. The association was largely dependent on the subscription fees paid by its members. However, their membership levels were very low hence the association was unable to raise sufficient funds to operationalize its plans. Despite the benefits of being a member of the association most teachers complained that the subscription fees of two hundred kwacha (K200) was too high. However, the amount in question was the same amount being paid by other associations in STEM. They also attested to the fact that some administrators do not support teacher hence the association does not meet all the targeted participants in a given gathering. And at times the number of representatives sent by schools was too low. They also cited lack of support by the district education board secretary's office to ensure all activities planned by ZAME DEC or that involved the participation of the association such as inter-district competitions were achieved.

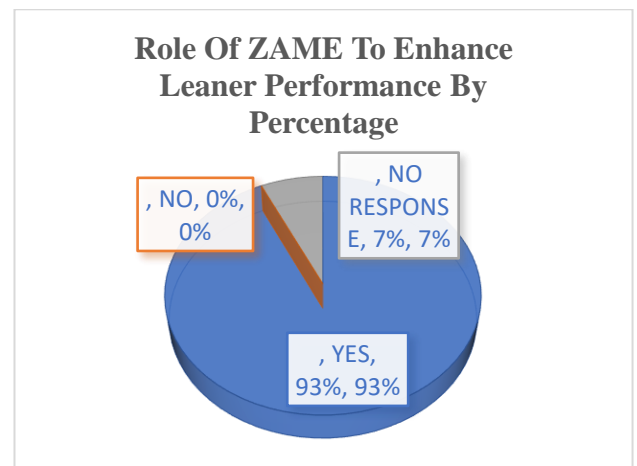
Head teachers observed that despite the many teachers of mathematics, very few were members of ZAME. Teachers of mathematics were seen to have apathy towards their association. Not being members meant that they lost out on important aspects that would have been addressed by the association. As it is said, there is strength in numbers hence, the association had very few members to support its operations or get to implement conference resolutions. While the association may have good plans, inadequate resources would hinder the smooth implementation of those plans. They added that despite schools having money at times, some administrators do not support teachers to attend ZAME meetings and the association at large.

The HODs also cited funds as the major challenge that the association was facing just as the ZAME DEC and head teachers had indicated. They added that some teachers were not cooperative in the payment of subscription fees. Furthermore, those that were not members lacked exposure to get first-hand information on latest trends and other developments in mathematics. Some teachers also showed inertia to implement changes. The other challenge referred to was tardiness to implement

resolutions and suggestions arising from conferences. Hence there was need for the association to intensify on monitoring and issue that all members and schools abided by the conference resolutions to the latter if the aims and goals of improved learner performance were to be achieved.

### 4.3 Role of ZAME in learner performance in mathematics

**Figure 6: Role of ZAME to enhance learner performance by percentage**



**Source: Field Data 2019.**

The high percentage of respondents agreeing that ZAME had a role to play in enhancing learner performance shows that the respondents appreciated the role that subject associations play in bridging the gaps that may exist among members and school. The association brings together teachers with the same specialisation under one umbrella to discuss challenges, solutions and best ways of teaching so that learner performance is enhanced.

When asked which strategies ZAME had employed in the past to try and improve learner performance at Grade 12 in mathematics the ZAME district executive members stated that they held capacity building workshops which targeted all teachers of mathematics. The workshops were characterised by content-based presentations. The association had also tried to strengthen the mathematics clubs by offering training of club leaders. Quiz and olympiads were conducted from school level through to zone, district and provincial. Teachers and learners were being encouraged to

participate in various competitions such as JETS fairs from school up to national levels. Apart from encouraging school collaboration, as way of creating interaction among members, the district association created a social online forum (WhatsApp group) where members would interact. The association has also tried to produce mathematical materials which members would refer to when teaching. However, the production of these materials was not regular and seemed only to be done during workshops where the participants would be availed with the workshop presentations.

The respondents brought out a myriad of benefits of either being a member of ZAME or attending workshops conducted by ZAME. The head teachers envisioned association workshops as avenues that provided room for members to share experiences and materials related to the teaching of mathematics. Teachers would exchange ideas on best approaches and methodologies for effective teaching and enhanced learner performance. ZAME workshops would also provide capacity building to teachers of mathematics not only in teaching methodologies but also content especially for the seemingly challenging topics. Thus, through capacity building, teaching skills of teachers/members are enhanced. The head teachers were also mindful that they could be other matters pertaining to the teaching profession that could have affected them therefore, being teachers specialised in the same subject, ZAME forums could also be used to address other professional issues.

Among the values of being a member or attending ZAME workshops, the HODs alluded to the fact that ZAME workshops create a platform where teachers of mathematics can share knowledge and skills required in the teaching of mathematics. Members or workshop participants are also kept abreast with new developments such as the revised curriculum and also share challenges encountered when teaching mathematics and how best the challenges can be resolved. Members also get to share ideas and experiences. However, one respondent observed that there were no significant benefits apart from sharing ideas. This meant that more was expected from being a member or attending workshops hence, the ZAME executive needed to come up with new innovations and

interventions to ensure that the needs and expectations of all its members were met adequately.

Teachers stated that there are many benefits arising from either being a member of ZAME or attending association workshops as academic and professional matters are addressed. Among these benefits, it was observed that through interactions with their colleagues, teachers share their experience in terms of challenges and success. They share teaching strategies that can be used to teach challenging topics and how best to cover the content in a particular topic. They develop, refine and share strategies that are aimed at helping the learners comprehend the subject matter better. Teachers are also updated on new developments and innovations in mathematics and share best ways of handling new topics such as computers in mathematics. Members also get to discover how to enhance their teaching given the available use of technology such as computers and related soft wares. As deliberations are conducted, teachers' areas of weakness are addressed. It is hoped that with the knowledge and skills gained, teachers become more confident and can lead to improved learner performance.

Other benefits cited by the teachers included learning how examinations are marked in mathematics and general trends of learner performance in mathematics. The members also tackle weaknesses of learners in their course of mathematics study and how best they can be assisted. In short teachers share ideas, challenges and ways of improving learner performance in mathematics. There were however other teachers that felt there were no much benefits from being a member of ZAME. This could be attributed to lack of variety in the activities during the meetings or that the nature of activities seemed not to yield the intended results of significant improvement in learner performance in mathematics. The respondent would have desired programmes that directly address pupil performance in mathematics, thus, there was need for ZAME to be seen to be doing more in trying to address issues of learner performance given the low pass rates of most learners in mathematics.

The ZAME district executive committee members were of the view that their association creates a platform not only to share experiences but also communicate to the teachers on new trends in mathematics. The trends could be arising from the re-alignment of topics in the revised curriculum and examination practises. They added that under ZAME, content discussed covered three subject which were mathematics, additional mathematics and computer studies. Challenging topics are not only discussed but also presented for member to appreciate the flow and salient points or concepts to emphasise and how best to handle lesson. Members are also provided with materials that can aid in teaching. Yearly examination of council reports for the three subjects are also shared for teachers to appreciate the successes and challenges that candidates present during grade 12 examinations. Having knowledge of these reports would help the teachers to adjust their coverage of content and identify the areas that need emphasising accordingly. As earlier alluded to, mathematics club patrons and matrons are offered training during ZAME workshops. Through workshops or being a member of ZAME also widens interaction with teachers from other institutions as teachers are exposed to a wider community of teachers with their same area of specialisation.

The guidance and counselling teachers brought out five benefits accrued from being a member of the mathematics association. They stated that arising from being a member, one would get acquainted with the new syllabus as members get to share its contents, learn new skills and the best methodologies for that can be applied when teaching mathematics, learn how to teach challenging topics and certainly achieve continuous professional development.

The response on the association being able to create a link between its members on one hand and curriculum developers and examiners on the other hand had a larger percentage (60%) of the view that the association had not achieved this objective. This shows that the administrators had not seen significant linkage between the teachers and the other two bodies. Only examiners could have had a direct link with the examining body during the marking sessions. However, the researcher wanted

to understand the level of collaboration among the three in terms of planning, production and evaluation of the mathematics curriculum and mathematics examinations and the responses revealed that there was little collaboration.

While structures existed at district, provincial and national levels establishing ZAME structure at school level would bring the association much closer to its members. As each member of the association is a valuable stakeholder in running the affairs of the association, material production could be done by members. Members in different schools could be assigned to produce assorted materials that could be used for teaching and learning. The head teachers suggested that the executive members at district and provincial levels should engage in regular monitoring of implementation of ZAME activities at school level. Furthermore, the association was called upon to increase activities at zonal and district levels. Member could also share revision and remedial work so that learners are exposed to a variety of questions. The association was also advised to intensify on completions apart from the usual quiz and Olympiads and conduct regular results analysis at various levels in ZAME. It was envisioned that regular results analysis would help members keep track of their performance in relation to other schools within the same cluster.

While the association could have made strides in the past the head teachers noted that there was need for the association to ensure educator from the primary and secondary were brought together to critically address the problem of low learner performance in mathematics. By bringing those at the grassroots, challenges at the lower level could be addressed hence reduce perpetuating further negative effects towards mathematics. This could also in a way reduce the blame on learners having a poor background as is the case. The association should ensure that ZAME activities are also strengthened in primary schools. As secondary schools draw their learners from different backgrounds and locations, needs of learners from rural or peri-urban areas should also be taken into consideration.

Various stakeholders such as the examination council of Zambia (ECZ), the curriculum

development centre (CDC) and the teaching council of Zambia (TCZ) could help in the ZAMEs' quest to achieve its objectives and plans. It was observed that there was a gap between developers and examining bodies on one hand with teachers on the other due to limited for a in which the three would interact. During conferences, members should go through the examiners reports and address the concerns raised by educating each other on how best to handle the teaching and learning process. This would lead to learners being adequately prepared for the exams.

HODs observed that the low numbers of ZAME members is associate to the high subscriptions fees hence the need to consider reducing the subscription fee so as to attract more teachers of mathematics. While the onus may not be on ZAME but on school administration, being supportive to all teachers in the department was cited as one of the strategies ZAME could put in place to improve learners' performance. However, each teacher has different needs and it is important to ensure everyone is brought on board by satisfying individual needs. The association was called upon to have an open-door policy for its members and other stakeholder who may suggest ways in which the association could run better. While learner performance in mathematics may generally be low among most schools, those whose results had been improving could be called upon to share their strategies so as to motivate others to emulate. They added on the need not only to focus on topics that are challenging for teachers, but also attend to the needs of the learners by addressing topics that learners find challenging. By doing so, the needs of the teachers and learners would be met.

Capacity building should be strengthening and teachers should be encouraging to activity participate in mathematics activities. Conducting intra and inter school quiz also needed to be more regular to help sharpen the learner's computation skills. The HODs also suggested that the association should prepare common schemes so as to help teachers who had just joined the profession but also act as a guide on content and depth of coverage for a given topic. It would also help teachers adjust accordingly on coverage of the syllabus. The association was also called upon to engage in

material production. Given the scarcity of books, study material would guide teachers on which content to cover and how, thus ensure adequate coverage of topic and syllabus.

The significance of the association encouraging research work was highlighted. Given the many problems faced in the teaching and learning of mathematics, it was suggested that members should be encouraged to engage in research work in relation to the field of mathematics. Teachers could be encouraged to compete in research work with the best research report receiving a token of appreciation.

Teachers called upon the association to encourage teachers of mathematics to attend school based CPDs and continue with capacity building workshops that aimed at keeping teachers updated with latest trends in mathematics. The meeting needed to be held frequently, preferably during holidays to avoid losing contact time during school days, unlike having only one district meeting per year. ZAME was called upon to introduce zonal CPDs and ensure that the activities are very active as it could be easier for teachers to participate at zonal and district level. Teachers stated that ZAME needed to find ways and means of making every teacher of mathematics to attend all its meetings. It was observed that very few attended these meetings and at times it was the same teachers that attended these meetings hence leading to apathy towards the ZAME by those who were not selected to attend ZAME workshops. Administrators in schools needed to ensure that each teacher was given an opportunity to attend ZAME meetings. However, while the onus to send representatives to attend workshops may have been administrative, they were need for the teachers to ensure that they were fully paid-up members of the association and active in the school clubs. Subscription fees were also seen to be high hence the need to be reduced.

The associations were encouraged to find out from the learners' topics or concepts which were challenging to them and seek ways of addressing such challenges. The teachers added that in addition to discussing challenging topics for teachers and learners are discussed the association should also be able to bring up both teachers and learners on board



by having demo lessons during the conference. Teachers need to develop healthy and comfortable circumstances while delivering lessons in mathematics to overcome the difficulty of the students and protecting them from becoming dull and getting boredom.

Teachers suggested that ZAME should prepare and manage composite exams for exam classes. This would mean all learners in the district being subjected to a common mock. Doing so would ensure that learners are exposed to standard of exam questions. It was also suggested that the best performing pupils in the mock exams should be awarded. Teachers also needed to be trained on how to set and mark test or exams according to ECZ standards so that learners from an early stage of their secondary education are exposed to the correct format of exams. As the focus was on improving learner performance in mathematics at grade 12, teachers suggested that, results analysis for a given period (mock or otherwise) should be conducted comprehensively by suggesting measures that would improve results in the subsequent exam or year. In the year of reveal, members should discuss whether they implemented the suggestions and the results yielded thereafter.

ZAME officials were also encouraged to make follow up schools and district to monitor and evaluate the implementation of conference resolutions and try to attend or facilitate during school based CPDs. Teachers who a willing to make presentations during conferences should be given a token of appreciation. Furthermore, teachers or learners who take time to help slow learners should be given some incentives. However, ZAME can only suggest such practices to schools especially where the practise has yielded the intended positive results. The association was encouraged to intensify intra and inter school competitions. There was also need encourage teachers to compete amongst themselves and also to come up with a variety of activities for the learners apart from quiz and olympiads and attach a prize to the best performers.

Learner could also be motivated by sourcing for sponsors to provide scholarships to hardworking students from grade 10 to 12. Though some teachers

suggested that ZAME should provide books that are up to date, this may not be attainable given financial constraints that is faced by the association. However, they could only suggest recommended books and other reference book that teachers could use when teaching or bring other stakeholders on board to help school acquire the necessary books and other resources as is the case where ZICTA is helping schools acquire computers for learners. Production of teaching materials was also suggested by the teachers. Such materials would be used for reference especially where the recommended books were not available. Resource production could also help teachers appreciate the various teaching aids that they could use to help learners comprehend concepts easily for instance a globe made out of wires for teaching earth geometry. There was also a need for the association to seek ways in which there could be more networking amongst the teachers for easier sharing of knowledge, ideas, skills, challenges and solutions. Some teachers suggested that teachers allowing teachers to teach in another school could help in exchange of ideas and also expose learners to other teaching strategies.

The guidance and counselling teachers were of the view that ZAME would help improve learner performance if there was an effort to ensure that all teachers of mathematics were members or that ZAME membership was mandatory for teachers of mathematics. They further called on the need to be more pragmatic in the implementation of the associations' plans and involve other stakeholders. As teachers cannot be expected to be knowledgeable about all aspects of school reform, subject matter, standards, or professional practice, collaboration with knowledge sources outside a teacher's immediate circle is crucial. Outside experts such as university-based educators could bring fresh perspectives and ideas about what has been proven successful elsewhere and an analytic stance toward the school improvement process. While the low performance could have been common, there were other schools that were excellent and these could be called upon to share the strategies they were using to improve and maintain good results. As other respondents had alluded to, continuous assessment was an avenue through learners would be given more practise and evaluated. Teachers also needed to be encouraged

to work together especially in solving mathematical problems that were challenging as team work would yield better results. Teachers also needed to engage in educational material production in mathematics for use by learners and teachers. ZAME also could create a library where teachers and learners could easily access information pertaining to any area of interest in relation to mathematics. The association was also called upon to encourage schools and teachers to conduct educational tour where learners would appreciate the applications of mathematical concepts in industry and other day to day life experiences. Such tours would also help teachers to make reference to concrete things in the environment when teaching, other than teaching the subject in abstract.

The concepts from ZAME-DEC were in tandem with the suggestions from the head teachers, HODs, teachers and guidance teachers on some measures which the association could put in place with a view of improving the low learner performance in mathematics at grade 12. They highlighted on creation of ZAME structures at school level, increasing local workshops, increase monitoring schools to ensure that programs such as CPDs, mathematics club, quiz and Olympiads and assessments were being implemented accordingly, increasing the competitions were learners and teachers would participate and motivate deserving teachers and learners. There was need also to bring on board other activities other than quiz and olympiads. They also observed on the need to work with ECZ especially on setting of questions.

## V. CONCLUSION AND RECOMMENDATIONS

The conclusions drawn based on the research findings was that the major causes of low learner performance were learners' poor negative attitude, poor study skills, dependency on calculators, absenteeism and over dependency on examination leakages contributed to their low performance in mathematics. It was observed that some teachers also had a negative attitude towards mathematics, did not adequately market the subject, lacked enthusiasm when teaching, did not used ideal teaching methodologies, taught the subject in abstract and rather teaching for understanding teachers taught in order to finish the syllabus. Some

topics were not taught, remedial work and home work were not given frequently and in some cases were not given hence learners did not have enough practise and slow learners continued to lag behind. Levels of absenteeism among some teachers was high coupled with competence and not allowing questions from the learners were cited as contributing to the learner's poor performance in mathematics. Parents were not fully involved in the learning process of their children either due to not having knowledge about the subject area, negative attitude towards the subject or other social factors. Factors that could addressed administratively included high teacher–pupil ration, inadequate teachers, inadequate teaching and learning materials, bulky syllabus amidst reduced teaching periods.

Measures put in place to improve learner performance included strengthening departmental school based CPDs and revamping the mathematics clubs, increased monitoring of lessons by administration, frequent assessment and results analysis to appreciate the trend of learners' performance, rewarding deserving learners and teachers, increased homework and contact hours for exam classes and procurement of more books. While these strategies could have worked for some school, a large number still needed to do much move to ensure a significant improvement of learner performance in mathematics.

Evidently the ZAME was grappling with a lot of challenges arising from lack of resources to implement its plans. The membership levels were very low due to apathy by the teachers of mathematics. Trying to widen its membership was a challenge as members felt the subscription fee was seen to be high and, in some cases, paying membership was attached to attending workshops. Some teachers had grown weary as they saw no need of being members as they were not guaranteed of attending workshops and some instances the same teachers were sponsored by the school to attend workshops while in some schools no teacher would be sponsored. Low attendance of workshops by the teachers led the implementation of conference resolutions to be fragment thus the district was not seen to be moving in union in achieving plans of the association. The association

also seemed not to have a direct link with ECZ and CDC thus queries about the examination and the curriculum did not get prompt response.

Subject associations are an important source of professional development for teachers and their effectiveness depends on the extent to which they are genuinely committed to take judicious decisions and act accordingly. ZAME was viewed as an association which was cardinal in the teaching-learning process and its role in enhancing ultimate learner performance was significant. Thus, suggested strategies that ZAME could employ in order to help improve learner performance in mathematics at grade 12 included strengthening CPDs in schools, getting closer to its members and levels of implementation by introducing ZAME structures at school and zonal levels, intensify monitoring of the implementation of its' programmes at various levels, prepare and administer common mock for exam classes, analyse results comprehensively with a view of improving subsequent results, engage teachers in research, intensify material production, awarding those that excel or contribute towards mathematics. Workshops could be made more interactive when addressing challenges faced by teachers and learners but also bringing learners on board as the ultimate goal is positive learner performance. ZAME should widen its membership by devising strategies that can draw more teachers of mathematics to join ZAME and ensure a larger percentage of these teachers regularly attend workshops. Networking amongst the teachers is cardinal as they get to share innovations, knowledge, skill, challenges and remedies thus coming creating a platform would help teachers share information.

### **Based on the findings, the following recommendations were made:**

In view of the above findings, the following recommendations were designed for implementation by ZAME and other stake holders so as to improve learner performance in mathematics.

1. ZAME should take a more proactive stance to address the contributory factors that lead to low

learners' performance in mathematics at grade 12.

2. ZAME should consider introducing and intensifying its programs at lower levels structures such as school and zonal levels which are implementation levels and were more teachers could be captured.
3. ZAME should collaborate with stakeholders such as examinations council of Zambia (EJC) and curriculum development centre (CDC) for synchronised implementations of the mathematics curriculum.
4. ZAME should campaign for more membership and find ways of to ensure teachers and learners benefit from their programs by creating a web site.
5. Further research can be conducted on the role of ZAME in curriculum development.

### **VI. ACKNOWLEDGEMENTS**

I thank The Almighty God who is always there to support me in my endeavours in life and has sent selfless men and women who have been instrumental and enabled me to ably complete this task.

My sincere gratitude and appreciation to my supervisor Mr Kabubi Marvin for his invaluable expert guidance and continued support throughout the study. His constructive remarks and comments on each phase of the research work have contributed to the fruitful outcomes of this research.

A special thanks to my brother Stewart H, Ndhlovu and his wife Gertrude H. Ndhlovu for their positive criticism that helped to refine my work. My Children Mangaliso and Thulani for allowing me to work in a conducive environment.

I thank Zambia Research Development Centre (ZRDC) for awarding me a scholarship to pursue a Master of Education in Mathematics Methodology at the Information and Communications University. I also thank the lectures of ICU who took me through the various courses.

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