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# Improving Mathematics Education through Teacher Professional Development: A Tanzanian Perspective

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## ABSTRACT

This study aimed to explore mathematics teachers' perceptions of professional development. The study involved two public secondary schools in Ilala Municipality, Dar es Salaam. This was a qualitative study based on case study design. The study involved fourteen (14) participants that were selected purposefully. Two (2) heads of the schools, two (2) Academic Teachers, two (2) heads of mathematics departments, and eight (8) mathematics teachers were equally involved from both schools. Interviews, focus group discussions, surveys, and document analysis methods were used in data collection. Both interviews and focus group discussion were audio-recorded by using a protected smartphone with password to ensure data security. The documents reviewed includes; school policies, school calendars, and mathematics departmental meetings' minutes. The data collected were analysed thematically to identify and interpret key themes. The data analysis was based on the following steps: transcription, data reduction, presentation, and discussion of findings. Fictitious names were used for names of people and schools to ensure confidentiality and anonymity. The study revealed that teachers perceived professional development as formal programs to improve teachers' quality that were time-consuming and costly, while informal professional development programs were overlooked by teachers and other educational stakeholders. The study recommends that, in order to improve teachers' quality as intended in professional development, there is a need to raise awareness for both formal and informal professional development programs among teachers and a learning community as a whole.

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## 1.0 Introduction

The importance of mathematics in daily life is undeniable, as it becomes increasingly vital as individuals grow and interact within their social and environmental contexts (Michael, 2015). Mathematics serves as a cumulative subject that functions as a language to express ideas (Kropko, 2016) and a science of patterns (Pound & Lee, 2015). It is a tool for solving problems, a foundation for scientific and technological study, and a means of modelling real-world situations (Chambers & Timlin, 2013). Essentially, mathematics is a language comprised of numbers, symbols, and patterns, and its pervasive presence in our lives is undeniable (Legner, 2013). It is an essential component of human endeavors at various levels (Pound and Lee, 2015). Moreover, mathematics serves as a gateway to further studies in science and other related disciplines, providing a versatile toolkit for problem-solving and critical thinking (Sundai & Sheriff, 2015). Therefore, various facets of mathematics find relevance in our daily lives, making it a core subject in educational curricula worldwide, including Tanzania. However, the widespread importance of mathematics is juxtaposed with a recurring issue—the persistent challenge of poor performance among students in this subject. In Tanzania, as in many other regions, mathematics is a compulsory subject for all learners from pre-school to secondary schools (Halai & Clarkson, 2016). In Tanzania, numerous efforts have been made to improve mathematics education, including in-service training, seminars, and collaborations with international organisations like the Japanese International Corporation Agency (Halai & Clarkson, 2016). Despite substantial efforts to enhance its teaching and learning, studies consistently report low performance in mathematics (Kalolo, 2014; Michael, 2015; Sa'ad, Adamu, & Sadiq, 2014). Factors contributing to this dilemma are multifaceted.

Firstly, the shortage of qualified professional mathematics teachers has been identified as a significant impediment to students' success (Mkumbo, 2014). This shortage leads to teachers with limited content knowledge, which in turn affects their ability to effectively articulate mathematical concepts to students (Mbugua et al., 2010).

Secondly, students' negative attitudes toward mathematics, coupled with a fear of the subject, have been identified as barriers to effective learning (Tata, 2013). These attitudes can create a psychological barrier that hampers students' engagement with the subject matter. Additionally, mathematics anxiety, which is characterised by a significant correlation between high anxiety levels and low academic performance, further compounds the problem (Pourmoslemi, Erfani, & Firoozfar, 2013).

Thirdly, overcrowded classrooms, poor teaching methodologies, and inadequate teaching materials hinder effective teaching and learning experiences (Mlowosa, Kalimang'asi, & Mathias, 2014; Chirimi, 2016). Teachers are often burdened with heavy workloads, making it difficult to pay attention to students. The inadequacy of teaching resources and materials further limits their ability to deliver engaging and effective lessons. Furthermore, the dearth of instructional resources, including teaching materials and technology, exacerbates the challenge (Mkumbo, 2014; Sa'ad et al., 2014).

Lastly, the overall working conditions for mathematics teachers in Tanzania, including poor infrastructure and a lack of library and laboratory facilities, create a challenging environment for both teachers and students (Nyandwi, 2014). Truancy among students, especially in mathematics classes, aggravates the issue (Soko, 2014).

In light of these challenges, professional development emerges as a crucial strategy to address the needs of mathematics teachers and enhance their ability to facilitate effective learning experiences. Such professional development programs emphasise improving teachers' content knowledge and their ability to integrate technology into teaching (Scheerens, 2010). The diverse needs of teachers require a variety of professional development forms, ranging from seminars and workshops to observations, assessments, and mentoring (DeMonte, 2013).

Professional development, whether formal or informal, is used universally to strengthen the

working abilities of people in numerous fields, including the teaching profession (Aslam, 2014). In different contexts, professional development is termed as continuous professional development (CPD), professional learning, in-service training, or continuous learning. Teacher professional development (TPD) is used by many countries worldwide to improve teachers' quality, which ultimately improves students' performance. According to Murray (2014), teacher professional development that focusses on improving students' learning needs active teacher engagement. While some authors agree on active learning for teachers in teacher professional development, other authors see the primary focus as improving practice and teacher quality. For example, Mizell (2010) contends that "professional development in the teaching career is the strategy that schools and districts use to ensure that educators continue to strengthen their practice throughout their career" (p. 3). Teacher professional development is the most effective method of acquiring knowledge, gaining experiences, and sharing it all through the teaching profession (Gemeda & Tynjälä, 2015). Kennedy (20 16) added that professional development promotes improved teaching. Additionally, DeMonte (2013) supports that "it has the potential to improve the quality of teaching through the utilization of high quality professional development" (p. 19). However, teacher professional development programs do not impact student learning directly as they ought to, but their influence is reflected in the impact they have on teachers' knowledge as well as on the teaching profession (Golob, 2012).

Teacher professional development is concerned with both novice and experienced teachers, as supported by Zeichner (2009). For novice teachers, teacher professional development is offered to them in the form of an induction course for the purpose of helping them to adapt to the new school environment and practicum, while professional development for experienced teachers involves in-service training and continuous learning (Mizell, 2010). The study conducted by Hennessy, HaBler, and Hofmann (2015) reports that factors that influence teacher professional development include school leadership, teacher motivation, availability of resources and opportunities, students' abilities according to teachers' visions, teamwork, and the needs of the parents and policymakers to work together for the common goal. Similarly, Avalos (2011) contends that the nature and operation of educational systems, policy environments and reforms, and teacher working conditions are factors that determine what is accepted or not as a suitable form for professional development. This means that teacher professional development depends on the way the educational system is operated in a particular context. In addition, factors that influence teacher professional development for experienced teachers entail change in curriculum, new pedagogy, development of science and technology, and learners' needs (Edutopia, 2008).

Mathematics teachers, as in other fields, need professional development to improve their ability to teach their subject. Professional development for mathematics teachers has all features of professional development except that, often, it is specifically tailored for mathematics teachers. The professional development programs utilized in other subjects may bear similarities to those in mathematics, but the content and teaching strategies may vary due to the unique nature of the subject. Chambers and Timlin (2013) assert that mathematics serves as a tool for problem-solving, serves as the foundation for scientific and technological research, and provides methods for modeling real-world situations.

Professional development for mathematics teachers aims to equip them with teaching knowledge and skills that finally enhance student achievement in mathematics subjects (Jacob, Hill, & Corey, 2017). Darling-Hammond, Hyler, and Gardner (2017) contend that efficient professional development is structured professional learning that impacts teachers' knowledge and practices, hence improving student learning. Various studies internationally and locally continue showing the on-going poor performance in mathematics subjects (Halai & Clarkson, 2016). These studies recommend teacher professional development, among many others, as a way to improve students' performance in mathematics subjects (Gemeda & Tynjälä, 2015). Mason, Burton, and Stacey (2010) suggest that, in

order to improve student performance in mathematics subject, both quality teacher training and professional development are of great importance since professional development assists teachers to teach in the ways that culminate students in a smooth understanding of mathematical concepts.

However, studies recommend one way of improving student performance in mathematics subjects is to ensure teachers participation in professional development that focusses on improving teachers' quality. In the Tanzanian context, there are varied ways in which mathematics teachers perceive professional development (Murray, 2014; Zeichner, 2009). These perceptions may impact how they participate and implement the intended professional development programs. As a result, this study aims to explore mathematics teachers' perceptions of professional development. Through an in-depth examination of teachers' perspectives, strategies to enhance professional development opportunities can be identified and, in turn, improve mathematics education in Tanzania. This study is a step towards addressing the persistent issue of poor mathematics performance and ensuring that students have the necessary foundation to excel in this critical subject. Therefore, this study seeks to delve into the perceptions of teachers regarding professional development, particularly in the context of mathematics education.

## 2.0 Materials and Methods

This study employed a qualitative approach to explore mathematics teachers' perceptions of professional development. The study adopted a case study design to enable an in-depth understanding of a phenomenon within the study's unique context (Mertens, 2015; Yu, Abdullah, & Saat, 2014). Data were collected from mathematics teachers, heads of mathematics departments, Academic Teachers, and Head Teachers. This selection of participants was made based on their shared characteristics and ability to provide relevant information about mathematics teachers' professional development (Arora Mattis, 2007). The study employed the purposive sampling technique in the selection of schools and teachers to be involved in the study. The schools under this study were selected based on the size of the teaching force to ensure an adequate number of mathematics teachers, as supported by Sephania, Too, and Kipng'etich (2017), who say that shortage of teachers is a growing problem in many developing countries that offer free or public education, like Tanzania. Thus, the preference was given to schools with large numbers of mathematics teachers. Subsequently, the study required ten (10) mathematics teachers from both schools; the selected schools had a satisfactory number of mathematics teachers for the study. One of the schools had nine (9) mathematics teachers, while the other had twelve (12) mathematics teachers. As a result, this study involved fourteen (14) participants from two public secondary schools in Ilala Municipality in Dar es Salaam. Two (2) were the heads of schools from both schools, two (2) Academic Teachers, one (1) from each school, two (2) heads of mathematics departments, one (1) from each school, and eight (8) mathematics teachers, four (4) from each school.

In this study, the data collection methods involved were semi-structured interviews, focus group discussions, surveys administered as open-ended questionnaires, and document analysis. The two (2) heads of mathematics departments from both schools participated in the interviews, focus group discussion, and document analysis. On the other hand, the two (2) Head Teachers participated in the study by providing information through interviews, open-ended questionnaires, and documents with information about mathematics teachers' professional development programs in their schools. Similarly, Academic Teachers from both schools were helpful in providing information on how mathematics teachers were supported in professional development. Two focus groups, one from each school with four mathematics teachers were formed to discuss professional development. Interviews and focus group discussions were recorded in audio form on well-protected smartphones. Participants were personally delivered surveys administered as open-ended questionnaires to fill out information about their

perspectives on professional development. Further, document analysis was used to collect information about the inclusiveness of professional development programs in school strategic plans. The document analysis involved the school timetable, school policies, and minutes of mathematics departmental meetings. We used these four (4) methods to triangulate data, following the recommendations of Flick (2014) and Yin (2009), who suggest that methodological triangulation is a systematic approach to broaden the scope, depth, and consistency of the findings. Thus, it ensures the findings credibility by avoiding the bias of using one method (Thomas, 2016).

The data analysis process was ongoing and concurrent with data collection. Data analysis was done based on research questions. Thematic analysis was used to identify and interpret key themes from the data. According to Grbich (2013), this process involves reducing the data using the verbatim transcripts. Therefore, data were analysed in the following steps: transcription, data reduction, presentation, and discussion of findings as suggested by Walliman (2011) and McMillan (2014). The data collected from interviews and focus group discussions was transcribed, while the data collected from open-ended questionnaires and documentary analysis was typed and presented in line with all other information. The collected data was transcribed immediately within 24 hours after their collection in order to maintain the actual meaning of the information given by participants (King and Horrocks, 2010). To ensure their matching, the guidelines for interviews and focus group discussions were repeatedly checked against the recorded audio data. Finally, according to Aurini et al. (2016), data should be coded according to themes based on literature reviews and research questions, as was the case with this study.

An ethical clearance certificate was obtained from the ethical review committee when considering ethical issues. The regional, municipal, and school research permits were collected from responsible authorities. Informants were also provided with consent forms together with information sheets about the research study to read and fill in, which doing so implied that they allowed the use of findings for various research purposes. Fictitious names for names of people and schools were used in this study in order to ensure confidentiality and anonymity. Additionally, the informants were given the freedom of withdrawing from the study once they felt uncomfortable to move on. Further, the informants were free to decide not to answer any question of their choice without any adverse results. For data security, data was saved in a password-protected computer and smartphone (Ørmen, J. & Thorhauge, A. M. (2015).

## 3.0 Results

The study found that teachers perceived professional development as formal programs such as seminars and workshops, as well as continuous learning aimed at improving teachers' quality. They perceived these programs as time-consuming and costly practices. On the other hand, the study revealed that informal professional development programs were overlooked by mathematics teachers and other education stakeholders.

### *3.1 Teachers' Understanding of Professional Development*

The first research question aimed to investigate how mathematics teachers perceive teacher professional development. According to the data analysed in this study, teachers perceive professional development in different ways. Some teachers view professional development as a program to improve teaching activities, while others see it as continuous learning.

#### *3.1.1 Programs for Improving Teaching Activities*

Teacher professional development as programs for improving teaching activities include seminars, workshops, further education and courses. In the open-ended questionnaire, a mathematics teacher in school B state that: *"These are programs given to teachers to help them to improve their performance in teaching activities"* (Teacher, 3B). Another mathematics teacher in the same school explained, *"Teacher professional development is to add more knowledge to teachers in programs like seminars, workshops and further education"* (Teacher 2B).

Additionally, in the focus group discussion with mathematics teachers in school B, one mathematics teacher said:

> *For example, When I was at college I didn't learn anything about accounts. Later on, when I was already in the teaching field, accounts were introduced as one of the topics in Form Three Basic Mathematics Syllabus. Thereafter, we got seminar from somewhere, we were called over so that we can learn and master the topic.*
>
> (Teacher 5B)

The document analysis revealed that the school calendars from both schools included less formal professional development programs such as staff meetings, department meetings, subject panel meetings, and class meetings (School A calendar; School B calendar). Similarly, the minutes of the mathematics department meetings reviewed revealed that the schools had a culture of conducting various meetings, which could be classified as less formal professional development programs. In addition, to describe teacher professional development as programs aimed at enhancing the teaching process, some teachers also articulated its purpose as a means of enhancing knowledge, skills, and attitudes. For instance, in the interview with the Academic Teacher of school A, teacher professional development was explained as "*a process of improving teachers' knowledge*" (Academic Teacher school A). Likewise, the head of mathematics department in school B explained, "*Teacher professional development meant to add skills in order to facilitate teaching in that subject*" (Head of mathematics department in school B). As a consequence, teachers perceive professional development as programs for improving teaching activities.

### *3.1.2 Continuous Learning*

While some teachers perceive professional development as programs for improving teaching activities, other teachers referred it as continuous learning. In support of this view, the Head Teacher in school B explained that:

> *Teacher professional development simply referred to the process of learning that aimed at earning or maintaining the professional credentials such as academic degrees or formal courses.*
>
> (Head Teacher of school B)

Correspondingly, one mathematics teacher in school A supposed that, "*Teacher professional development is the act of teachers updating themselves in their career*" (Teacher 2A, Open-ended questionnaire). During an interview in school A, another mathematics teacher argued as follows in relation to continuous learning:

> *Currently, we are teaching by using student-centered approach but in the past we were using teacher-centered approach, then in order to manage new methods based on student centered approach, it is important to learn more.*
>
> (Teacher 1A)

Further, in another interview with mathematics teacher of school B, it was pointed out that, *"professional development is linked to continuous learning whereby a teacher can be working while pursuing other courses or job-training"* (Teacher 1B). Moreover, the Head Teacher of school A in explaining the concept of teacher professional development said that, "*Teachers in profession should keep on learning*" (Head Teacher of school A). The Head Teacher in school A also added that,

> *Mathematics like any other subject is changing with time, teachers are now going globally imitating from other countries. So globally, when things are changing other things are also changing. So, we need some more knowledge, and the matter here is to quickly renew knowledge of the subject.*
>
> (Head Teacher of school A)

Therefore, teachers explained teacher professional development as a way to maintain professional credentials through job training and formal courses that placed it as a form of continuous learning. In summary, the study found that teachers understood professional development as formal programs such as seminars, workshops, and further studies.

### *3.2 The Benefits Mathematics Teachers' Attribute to Professional Development*

In this study**,** the second research question sought to investigate the benefits of mathematics teachers' attributes to professional development. These benefits, as identified by teachers, could be classified broadly into three categories: development of teachers' knowledge and skills; building teachers' confidence; and other benefits of professionals such as teachers' grades, promotion, and familiarity with educational society.

#### *3.2.1 Development of Teachers' Knowledge and Skills*

Teachers benefitted from professional development in developing their knowledge and skills. In supporting this, Academic Teacher in school B stated that, "the benefit of professional is to attain new mathematics knowledge of teaching and new perspective in solving its challenges" (Academic Teacher of school B).

Mathematics teachers also benefitted in improving their knowledge on difficult topics and new topics from reviewed curriculum used to be learned as a part of professional development as explained by a mathematics teacher in school B, "I get knowledge of teaching topics which are difficult like probability, three dimension (3D), linear programming etc" (Teacher 2B). Additionally, in the interview with mathematics teacher in school A, it was reported that:

> *There are some topics that we were not familiar with them but after attending professional development, I have improved to teach difficult topics like circles, congruency and similarity though during previous time I was not able to teach them, but nowadays I teach competently.*
>
> (Teacher 1A)

Similarly, in the open-ended questionnaire, one mathematics teacher outlined the benefit of professional development as, "*It improves knowledge and capacity in teaching*" (Teacher 2A). Further, in another interview in school A, head of mathematics department said that,

> *We get knowledge for different topics which were difficult to us. For example, long time there was no topic of accounts in mathematics. I think, it was introduced since 2005 instead of kinematics. Accounts was introduced in the syllabus while we, mathematics teachers, we were not business subject teachers. So, it was good for us to attend the seminars to get knowledge to teach this subject content.*
>
> (Head of mathematics department of school A).

The above findings support that; teachers benefited from professional development through improving their knowledge for teaching their subjects and thus, increasing skills especially in handling difficult topics.

Moreover, some teachers identified benefits gained from professional development in terms of developing new teaching skills that were then linked in some cases to improvement of teaching practice. The Head Teacher in school B stated in the open-ended questionnaire that, *"The benefits they are getting from professional development is the development of new teaching skills"*. Likewise, the head of mathematics department in school B also supported that, *"The benefit of professional development is to increase the skills of teaching mathematics"*. Another teacher in school B when mentioning skills which teachers were getting from professional development added that, *"They get skills on the use of internet to download materials, such as Momaths, and Geogebra to solve different questions"* (Teacher 2B). Further, mathematics teacher in school A provided an example of the benefit of professional development as a program that improve ability to teach (Teacher 1A).

#### *3.2.2 Building Teachers' Confidence*

Teachers were benefitted from professional development in building of their confidence in teaching and learning process. For instance, the Head Teacher in school B stated in an open-ended questionnaire, *"Professional development builds teachers' confidence and credibility"*. Similarly, in another open-ended questionnaire of mathematics teacher in school A argued about the benefit of professional development that, *"It improves knowledge and gain confidence in teaching"*

(Teacher, 2A). The effect of new knowledge acquired on enhancing confidence was also reiterated by the Academic Teacher in school B when responding about the benefits which professional development to mathematics teachers insisted that:

> *They [teachers] become confident when they are teaching mathematics. I can say, they become confident when they get the chance to discuss with other teachers during seminars and workshops. So, the benefits they get is to become confident when they are teaching mathematics because they discuss and they get new knowledge from the course that they take.*
>
> (Academic Teacher of school A)

The study findings show that professional development enabling teachers to improve their confidence in teaching mathematics. This improvement was due to knowledge and skills gained from professional development programs attended such as seminars, workshops and courses.

#### *3.2.3 Other Benefits of Professional Development*

Besides development of teachers' knowledge and skills and building teachers' confidence, other benefits of professional development were not directly linked to classroom teaching but still part of the professional life of teachers. The first such finding was the promotion of teachers' grade. In an open-ended questionnaire one Academic Teacher in school B said that, *"the benefit of professional development was job-related promotions"*. Another benefit of professional development was familiarity within the educational society. Teachers saw professional development as for enhancing mutual relationship through social interaction among teachers. The Head Teacher in school A in the interview said that, *"It is easier to be familiar with the educational society or community because you will be recognized"*. The teacher continued to say that,

> *People can recognize you because you are specializing in mathematics. People and students will recognize you because the subject is demanded by majority, then for that matter it is an opportunity for you.*
>
> (Head Teacher of school A)

In summary, the study pointed out the benefits attributed by teachers to professional development that include: development of knowledge and skills, building their confidence, grades promotion, and social interaction amongst themselves.

## 4.0 Discussion

The objective of this study was to explore mathematics teachers' perceptions of professional development. According to the study, mathematics teachers perceive professional development as programs that improve teacher quality. Some teachers refer to professional development as continuous learning. However, their understanding of professional development was based on formal programs. The study revealed that teachers lacked knowledge about informal or less formal professional development programs, which have the potential to enhance their quality.

### *4.1 Teachers' Understanding of Professional Development*

The first research question sought to explore how mathematics teachers perceive professional development. The study found that, teachers perceive professional development as programs to improve teaching activities and as continuous learning.

#### *4.1.1 Programs for Improving Teaching Activities*

Teachers refer to professional development programs for improving teaching activities. These programs were referred to as seminars and workshops that took place outside of their schools. Though they participated in various meetings, such as department meetings, subject panel meetings, and some discussions on challenging topics, they disregarded these activities as professional development programs, as categorised by Mizell (2010), which consist of formal and informal programs. Formal programs include seminars and workshops facilitated by external experts. On the other hand, informal professional development

programs include classroom observation, teamwork with colleagues, discussions, library study, mentoring, and peer coaching (Darling-Hammond et al., 2017; Mizell, 2010). In formal professional development programs, teachers used to be passive since experts were involved, while in informal professional development programs, teachers had to be active in sharing knowledge and skills among others. This perception is due to a lack of knowledge about professional development and its benefits, as supported by the OECD (2009).

#### *4.1.2 Continuous Learning*

The study also found out that, professional development was considered as continuous learning. This is in line with different scholars who explained the concept of professional development. Mizell (2010) argues that, professional development is an approach which is used in schools and districts to guarantee that, educators carry on improving their practice. According this study, this concept of continues learning meant further studies such as attending courses at colleges or universities. Again, this perspective ignored informal programs while insisting on formal professional development programs. According to Gemeda and Tynjälä (2015), continuous learning is the most efficient process and system of learning, sharing, and experiencing through teaching profession. This insist that, teachers can learn from their work places through interaction with their peers even without attending various courses at colleges or universities. Likewise, Aslam (2014) stated that, teacher professional development is ongoing process of acquiring knowledge, skills and values that relate to ones' area of work or profession. Teachers improve their knowledge, skills and values through various types of professional development programs that take place in schools.

### *4.2 The Benefits Mathematics Teachers' Attribute to Professional Development*

The second research question aimed to explore the benefits that mathematics teachers attribute to professional development. These benefits include the development of teachers' knowledge and skills, building teachers' confidence, and other benefits of professional development such as teachers' grades, promotion, and familiarity with educational society.

#### *4.2.1 Development of Teachers' Knowledge and Skills*

According to the study, professional development is intended to improve teachers' practice through the acquisition of knowledge and skills. The development of teachers` knowledge and skills is important in teaching, but it is not the only factor that influences professional development. Things are constantly changing, necessitating teachers to stay updated. Every new paradigm in teaching leads to a shift in approach, such as transitioning from a content-based curriculum to a competence-based one or from a teacher-centred approach to a learner-centred one. Additionally, the introduction of new content demands teachers to acquire pedagogical knowledge and pedagogical content knowledge (Shulman, 1986) through professional development. Furthermore, selecting strategies that are relevant to the context can be challenging due to a variety of factors, such as the availability or non-availability of teaching aids, the ability of learners, and the degree of variation between motivated and non-motivated students. As a result, professional development is required to equip teachers with skills that will enable them to select appropriate teaching techniques according to their contexts. Although teachers addressed students' negative attitudes toward mathematics learning, they did not link it to professional development. For example, what role can professional development play in motivating students in mathematics subjects? Therefore, professional development strives to enhance teaching practices by equipping teachers with the necessary knowledge and skills, which in turn can either directly or indirectly enhance students' learning and academic performance.

#### *4.2.2 Building Teachers' Confidence*

This study found that teachers gain confidence as they participate in professional development programs. Komba and Nkumbi (2008) explained the benefits of professional development: it assists teachers to upgrade their teaching, raises a sense of

worth, acquires promotion, and allows them to cope with science and technology study. Petty et al. (2016) support that professional development raises teachers' confidence. Teachers build up their confidence in teaching as they tend to address topics that seemed to be challenging for both teachers and students in the professional development programs. In the document analysis, it was observed that teachers discuss the topics that are difficult in terms of mastery of content and pedagogical knowledge in their meetings. This experience develops teachers' confidence in teaching those particular topics, which may ultimately have a positive impact on students' learning. Besides the development of teachers' knowledge and skills and building teachers' confidence, other benefits of professional development were not directly linked to classroom teaching but still part of the professional life of teachers. These benefits include promoting teachers' grades and familiarity within the educational society. In an open-ended questionnaire, one Academic Teacher in school B said that the benefit of professional development was "job-related promotions" (ATB). Teachers benefitted from professional development by being promoted after undergoing professional development programs. Furthermore, according to the participants in this study, the benefit of professionals was their familiarity within the educational community. Participants saw professional development as a tool for enhancing mutual relationships through social interaction among teachers. In the interview, the Head Teacher in school A said that "it is easier to become familiar with the educational society or community because you will be recognised" (HTA). The teacher continued to say that people can recognise you because you are specialising in mathematics (HTA). The people and students will recognise you because the subject is demanded by the majority, and for that matter, it is an opportunity for you (HTA). As a result, the study found that teachers can create social interactions with other teachers by participating in professional development programs. This could potentially extend to society by facilitating the discussion of various career-related issues.

## 5.0 Conclusion

This study was undertaken to explore how mathematics teachers perceive professional development. According to the study, teachers perceive professional development as programs for improving their teaching abilities, as well as continuous learning. Their perceptions were based on formal professional development programs, but they appeared to neglect informal ones.

## 6.0 Recommendations

The study recommends that teachers' awareness should be raised on the existing opportunities of informal professional development programs. These low-cost programs include mentoring, peer coaching, classroom observation, library study, and study tours. Both formal and informal professional development should be equally recognised by teachers and other educational stakeholders in order to encourage teachers' participation in professional development opportunities. This will ultimately lead to an improvement in teacher quality, which in turn will impact student achievement.

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