

Teacher Strategies for Reducing Mathematics Anxiety among Secondary School Students in Tanzania

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Abstract

This study explored strategies that teachers use to reduce mathematics anxiety among students in secondary schools in Tanzania. The study employed a qualitative exploratory case study design whereby data were obtained from 18 mathematics teachers and 40 students by using interviews, focus group discussions, and field observation. The data were then analysed thematically using Braun and Clarke's (2006) thematic analysis model. Different dominant factors that contribute to mathematics anxiety among students were found to be poor mathematics background, teachers' aggressiveness as well as the nature of mathematics as a difficult subject. Also, it was found that teachers can use various strategies to reduce mathematics anxiety among students which include teachers' self-control, the use of rewards and reinforcement, and engaging students in teaching. Although teachers play a crucial role in reducing students' mathematics anxiety, it is recommended that conjoint efforts should be made by several educational stakeholders to overcome the problem.

Keywords: Mathematics, mathematics anxiety, mathematics performances, secondary school students

INTRODUCTION

As fear and negative attitudes towards mathematics prevail, it is common to hear students and teachers in Tanzania saying “*Hisabati ni ugonjwa wa Taifa*” (mathematics is an illness of the nation). This expression simply suggests that mathematics distresses many people in the country because it is perceived as the most difficult of all subjects as many of them admit that they are failures in mathematics. Conversely, many students perform poorly in mathematics and others drop the subject when they go for further studies (Devine et al., 2012; Kihwele & Mgata, 2022). This confirms that many students in Tanzania tended to avoid mathematics and that’s why only a few people are in jobs that require mathematical knowledge (Devine et al., 2012). The tendency of avoiding mathematics is commonly referred to as mathematics anxiety. Mathematics anxiety can be described as a negative emotional reaction accompanied by feelings of discomfort that interfere with the ability to solve mathematics (Blazer, 2011; Careyet al., 2016). Iossi (2007) labels it as mathematics learning distress or mathematics phobia. Mathematics anxiety is characterised by a tendency of fearing or avoid learning, engaging or responding to questions, fear of failure, panic during a test or exam, and lack of confidence in mathematics (Bhat & Arumugam, 2020).

Despite its existence among people for decades, Willingham and Beilock (2020) report that research on Mathematics anxiety began in the 1970s and gained momentum only in the last ten years. Recently, across many countries, Mathematics anxiety among students has been reported to be high (Dowker, Sarker & Looi, 2016). Similarly, in Tanzania today, the level of Mathematics anxiety among students in secondary schools is reported to be high as compared to other subjects (Mohamed & Tarnizi, 2010; Kyaruzi et al. 2020). Studies suggest that a combination of biological, behavioural, environmental, social, cultural, and cognitive factors results in mathematics anxiety (Casad et al., 2015). More specifically, Mathematics anxiety is said to be impacted by teachers’ influence, personal factors, parental influence, peer influence, cultural factors, and the nature of the mathematics subject itself.

Mathematics Anxiety and Performances in Mathematics

There is a slogan that “Mathematics is life and life is mathematics”, which implies that mathematics is very important in different aspects of human development such as technology, business, finance, politics, health services and education. Given the importance of mathematics, many countries have made it a compulsory subject in schools (Tambunan, 2018). In the same vein, it is a compulsory subject in both primary and secondary schools in Tanzania

(Kisakali & Kuznetsov, 2015). Although it is compulsory in schools, students' performance in this subject is reported to be poor in several countries. Mohamed and Tarmizi (2010) conducted a comparative study in Tanzania and Malaysia on mathematical anxiety levels and their impact on performance among secondary school students. Findings revealed that students' performances in mathematics in both countries were significantly affected by mathematics anxiety; the more anxiety students have about mathematics the more they fail. Similarly, Mutega, Gitongi and Rugano (2021) in their correlation research design on mathematics anxiety, attitude and performance among secondary school students in Kenya, found that there was a relationship between mathematics anxiety and performance. These studies suggest that high mathematics anxiety results in poor performance and vice versa.

In the Tanzanian context, mathematics has been reported several times to be leading among subjects with poor performance in secondary schools (PO-RALG, 2020; MoEST, 2021). In response to this situation, the government, teachers, school administrators, parents, and other educational stakeholders have made several efforts to overcome the problem. For example, about 398 Mathematics teachers from schools with poor performance in mathematics participated in the continuous professional development training to boost and enhance their content knowledge and teaching skills (URT, 2019). However, despite these efforts, performance in mathematics is still alarmingly poor as indicated in Table 1.

Table 1: Secondary Schools Mathematics Pass Rate from 2017 to 2023

| Year | 2017 | 2018 | 2019 | 2020 | 2021 | 2022 | 2023 | Average |
|-----------|------|------|------|------|-------|-------|-------|---------|
| Pass rate | 19.2 | 20 | 20 | 20.1 | 20.46 | 20.08 | 25.42 | 21.21 |

Note. (PO-RALG, 2020; MoEST, 2016, 2017; 2018; 2019; 2021, 2022, 2023)

Studies conducted in various educational systems indicate that poor performance in mathematics is strongly associated with Mathematics anxiety (Khatoon & Mahmood, 2010; Kundu & Kar, 2018; Kyaruzi et al., 2020). That is, high Mathematics anxiety is strongly associated with poor performance, whereas low Mathematics anxiety is associated with high performance in the subject (Khatoon & Mahmood, 2010; Kundu & Kar, 2018). Thus, while addressing the issue of poor academic performance, Mathematics anxiety cannot be ignored. This is because students with Mathematics anxiety are often nervous, tired, and have a sense of fear and eventually refuse to learn mathematics notwithstanding its usefulness in human life (Zakaria et al., 2012). Similarly, as suggested by Masele and Twelve (2018), because both teachers and students perceive mathematics negatively, teaching and learning of the subject

become problematic. Generally, regardless of economic background, cultural beliefs, nationality, race, age and gender, Mathematics anxiety is a serious problem that has been affecting many individuals in the world for several decades.

Although several factors are reported to contribute to the overall trend of poor performance in mathematics, anxiety seems to be underrated. Consequently, despite its severity and association with poor performance in the concerned subject, only a few studies have been conducted to investigate it in Tanzania, most of them focusing on teachers' professional development (Kyaruzi et al., 2020) and the levels of Mathematics anxiety (Mohamed & Tarmizi (2010). As such, none of the previous studies has specifically focused on examining the strategies that teachers use or can use to alleviate Mathematics anxiety among students in public secondary schools. Generally, since many students tend to avoid studying mathematics irrespective of its relevance to many human activities and the fact that it is a compulsory subject in both primary and secondary schools in the Tanzanian context, it is necessary to conduct a study on this matter.

Teacher's Strategies for Reducing Mathematics Anxiety

Although students have an innate ability to learn, teachers play dual roles as they teach them. Teachers can be a source of students' anxiety (Bekdemir, 2010; Finlayson, 2014), and on the other hand, they can offer a solution to it (Iossi 2013; Finlayson, 2014). Teachers' roles are the most important factors that contribute to success or failure in mathematics (Saun, 2014). Finlayson (2014) affirms that many students develop mathematics anxiety as an outcome of the practices of mathematics teachers who are themselves anxious about their competencies in teaching the subject. However, a good teacher can reduce this feeling by utilising various strategies that are appropriate to the level of the anxiety itself. As Johnson (2017) emphasises, teachers may make their students highly motivated to learn if they create a conducive learning environment.

Even though it impacted the academic arena for several decades, Mathematics anxiety has been ignored and underrated. In Tanzania, the level of Mathematics anxiety among students in secondary schools is reported to be high as compared to other subjects (Mohamed & Tarmizi, 2010; Kyaruzi et al. 2020). Additionally, Kyaruzi (2021) found that physiological arousal such as anxiety adversely impacted students' performance. Kihwele and Mgata (2022) on the other hand found that the majority of students drop Mathematics due to the same reason. All these studies implicitly concluded that mathematics anxiety exists in Tanzania. Yet the literature is

silent on teacher strategies for alleviating mathematics anxiety among secondary school students in Tanzania. Hence, the current study examined teachers' strategies for reducing Mathematics anxiety among students in secondary schools. Specifically, this study sought to answer the following research questions:

- 1) What are the perceptions regarding mathematics anxiety among students in secondary schools?
- 2) What are the perceived factors influencing mathematics anxiety among students in secondary schools?
- 3) What strategies do teachers employ to reduce mathematics anxiety among students in secondary schools?

METHODOLOGY

Research Approach and Design

This study adopted a qualitative research approach in the collection and analysis of data so as to come up with rich information on the subject matter in question. Under this research approach, the study adopted an exploratory case study design. Since mathematics anxiety is underrated in the country, the exploratory case study design was adopted because it is suitable in examining cases that have no clear and defined outcomes (Lucas et al., 2018). Since student performance in mathematics is relatively poor in several schools in Tanzania, the researchers picked the Mwanza region randomly as a case for the study. Mwanza City Council was randomly selected as a case for the study out of 8 district councils in Mwanza region.

Sample

Qualitative research is ideal for small samples and its results are not for generalisation purposes (Bryman, 2012) but rather for gaining an in-depth understanding of the phenomena under study. In this study, six public secondary schools were selected randomly from the Mwanza City Council where three Mathematics teachers and at least six students were selected from each school. Also, a total of eighteen (18) Mathematics teachers were purposely sampled (Cohen et al., 2011) to take part in interviews because the researchers believed that the required information would be obtained from experienced mathematics teachers in secondary schools. Meanwhile, the selected students were forty in total. From these students, data were collected using focus group discussion (FGD) to complement the data collected through interviews with Mathematics teachers. Six FGDs (one in each school) were conducted. In each FGD, an

average of 6 to 8 students participated. Each FGD lasted for about one hour (Flick, 2014). Since Mathematics is a compulsory subject in secondary schools, convenience sampling was used to obtain students who were readily available and willing to participate in the study (Taherdoost, 2018). The number of participants in this study was 58 at the moment when the point of saturation was achieved, i.e. when the researcher could no longer obtain new information during the interviews (Creswell, 2014). All information about participants were treated with care and kept confidential such that their names and the names of their schools were not used but pseudo-codes were used to mask their identity. For instance, FGS1S1 to FGS8S1, FGS1S2 to FGS8S2, FGS1S3 to FGS8S3, FGS1S4 to FGS8S4, and FGS1S5 to FGS8S5 and FGS1S6 to FGS8S6 are codes used to identify the students who participated in the six FGDs. Similarly, IMT1S1 to IMT3S1, IMT1S2 to IMT3S2, IMT1S3 to IMT3S3, IMT1S4 to IMT3S4, IMT1S5 to IMT3S5, and IMT1S6 to IMT3S6 are used to identify Mathematics teachers who participated in the in-depth interviews in the six participating schools. Table 2 presents the profiles of study participants.

Table 2: Study Participants' Profile

| Participants | Variables | | Frequency (percent %) |
|-----------------|-------------------------|-------------------|-----------------------|
| Teachers | Gender | Male | 16 (89%) |
| | | Female | 2 (11%) |
| | Academic qualifications | Bachelor's degree | 12 (67%) |
| | | Diploma | 6 (33%) |
| | Teaching experience | Below 4 years | 5 (28%) |
| | | 5 years and above | 13 (72%) |
| Students | Gender | Male | 17 (42%) |
| | | Female | 23 (58%) |
| | Class level | Form one | 3 (7.5%) |
| | | Form two | 7 (17.5%) |
| | | Form three | 18 (45%) |
| | | Form four | 12 (30%) |

Instruments

Due to the nature of the study's research questions, the researchers applied multiple instruments of data collection in order to have a comprehensive understanding of the phenomenon under study (Yin, 2016). More specifically, this study utilised in-depth interviews, the FGDs and classroom observation in the collection of relevant data. Multiple methods of data collection were used for triangulation purposes to ensure the validity of the findings (Polit & Beck, 2012). Moreover, the observation method was employed in the classrooms, in which the researchers witnessed how the teaching of mathematics took place in the classroom, particularly how teachers and students interacted during the sessions.

Data Analysis

The data collected by using interviews and FGDs were tape-recorded, transcribed and subjected to thematic analysis in accordance with Braun and Clarke's (2006) six-step thematic analysis model. The six-step thematic model involves data familiarisation, creation of codes, searching and identification of themes, reviewing of themes, naming and defining the themes and finally producing a comprehensive report. Moreover, the data obtained through observation were integrated into the analysis process, coded, and analysed using the content analysis method.

RESULTS

Perceptions about Mathematics Anxiety

The first research enquiry explored the perceived prevalence of Mathematics anxiety among students and teachers, the difficulty of the subject matter, and Mathematics anxiety's relationship to gender. The participants' responses in relation to this question were coded based on the interviews and the FGDs as described below.

Prevalence of Mathematics Anxiety

Although several teachers admitted that there are few students who are more anxious about mathematics, they reported that there are some students who are not anxious about this subject because they are aware of its value in life as one teacher attested, "...some students are genuinely interested in mathematics, in fact, they are performing much better in mathematics as compared to other subjects" (IMT2S6, Male).

On the other hand, it was found that many students believe that mathematics anxiety is a common condition among the majority of students in secondary schools. They believe this to be the case among most students because mathematics is considered a very difficult subject as

many students perform poorly in that subject. For example, a student stated, “If you rank subjects that students fear most, mathematics will take the lead Actually, when you give them an option to choose mathematics over other subjects, they will easily go for other subjects.” (FGS4S5 – Male)

Mathematics Anxiety among Teachers

The majority of students argued that they were not sure whether teachers including those who teach Mathematics are anxious about mathematics, “I am not sure and I don’t think so if teachers also are afraid mathematics as students do” (FGS4S6 – Female). This statement suggests that students believe that mathematics anxiety is for students only. Mathematics teachers, on the other hand, had a perception that the subject frightens not only students but also some of their fellow teachers who teach other subjects as one participant attested:

Honestly, mathematics is feared not only by students but also by some teachers. To prove this, we come across several teachers of other subjects like English, Kiswahili, History and Geography wondering or asking us why we chose to teach mathematics even though it is difficult. (IMT1S1 - Female)

In the same vein, the researchers wanted to know whether Mathematics teachers themselves are anxious about mathematics. The findings indicated that the participants had mixed feelings. Some believed that some Mathematics teachers are anxious about mathematics whereas others believed that Mathematics teachers are not anxious about mathematics. Those who believe that Mathematics teachers are not anxious about mathematics argue that the majority of Mathematics teachers are interested in mathematics and that is why they decided to pursue it as their career, and they enjoy teaching it. Quite a few participants believed that some were anxious about it too. One teacher explained,

Some mathematics teachers have a poor foundation in mathematics, that’s why they are not comfortable with teaching mathematics as they tend to ask for help to teach various mathematics topics. (IMT3S5 - Male)

Generally, the findings indicated that due to the scarcity of Mathematics teachers in the country, the government made an effort to attract many students to study mathematics in crash programmes and provided full sponsorship or 100% loan to students taking mathematics in their university undergraduate studies. This is the reason many teach mathematics even when they are not qualified enough to teach the subject which situation in turn made some of them to be anxious about it.

Mathematics Anxiety and Gender

When asked whether gender has something to do with Mathematics anxiety, several teachers commented that gender has nothing to do with Mathematics anxiety as some males fear the subject no different than some females do. Similarly, they said that both boys and girls have equal chances of performing well in mathematics. Nevertheless, the findings from students were inconsistent with those from teachers. Many students argued that females are more anxious about mathematics compared to males. A research participant noted,

There is a notion that mathematics is for men. Try to figure it out in various jobs that demand calculations such as in many schools, you can't find a woman Mathematics teacher. The same applies to many jobs that require mathematics knowledge like statistician, economist, etc. There are fewer women compared to men, in fact females tend to have poorer mathematics performance than males. (FGS1S6 - Female)

This quotation implies that females are more anxious about mathematics than their male counterparts.

Perceived factors for the development of mathematics anxiety among students

The second research inquiry examined the perceived factors associated with the development of Mathematics anxiety among students. Through in-depth interviews, FGDs and classroom observation, the researchers identified eight major factors. As can be seen in Table 3, poor mathematics background was the most frequently reported factor, followed by teachers' aggressiveness and the difficulty of the subject itself.

Table 3: A summary of the factors for development of Mathematics anxiety among students

| Factors | Keywords (responses) |
|--|---|
| Poor mathematics background | Poor mathematical foundation and lack of practice in maths since childhood |
| Teacher's aggressiveness | Corporal punishments, caning, threats, slaps, reprimands and frog jumping. |
| Maths difficulty | Many calculations, complex formulas, confusing equations and complex puzzles. |
| Incompetence in teaching | Ineffective use of instructional strategies, poor framing of the questions, and poor teaching and learning aids/materials |
| Inborn learning ability in mathematics | Hard to learn, learning phobia, and difficulty in calculations |

| | |
|---------------------------------------|--|
| Negative attitude towards mathematics | Poor beliefs, negative perceptions and poor mindedness |
| Peer pressure | Discouragement, social influence and mob psychology |
| Parental factors | Parents' negative about mathematics, parent's inability to assist their children, and parental favouritism over other subjects |

Poor mathematics background

Analysis of the data revealed that Mathematics anxiety among students is largely a result of having a “poor mathematics background” in pre-primary and primary education. Both teachers and students argued in favour of the slogan ‘practice makes perfect’ as they revealed that many students in secondary schools had not practised mathematics in their previous education levels. According to the responses of the participants, this makes it difficult for them to learn mathematics in secondary schools, something which is greatly associated with their current negative attitudes towards mathematics. For example, one Mathematics teacher explained:

Sometimes you may find that some students were taught from the very beginning of schooling at the primary school level in a way that mathematics seemed to be difficult.....this in turn has led to the development of Mathematics anxiety among them (IMT2S1 - Male).

On the other hand, some students supported this by saying that:

Most of the students who have been found it very difficult since we started in primary school. Due to poor background, we afraid of mathematics since childhood (FGS3S4 - Female)

Teachers' aggressiveness

Teachers' aggressiveness was another most frequently reported reason for Mathematics anxiety. The participants claimed that the mathematics teachers are, in most cases, very aggressive. They particularly tend to employ punitive methods and intimidation during teaching as a means to make students get serious in learning mathematics so as to perform better in the subject. A focus group discussion put it this way,

Mathematics teachers are so aggressive; they always come into the classroom with a stick. Whenever students fail to answer questions properly, they will be punished

severely. That's why, many students are very afraid of Mathematics teachers, and the mathematics subject itself (FGS2S2 - Male)

This was supported by teachers, one of who remarked, "Some mathematics teachers are so aggressive, teaching without a stick is like impossible for them, which in turn however, develops maths anxiety among the students" (IMT3S5 - Male).

Difficultness of mathematics

Difficulty of Mathematics as a subject was also frequently reported by both teachers and students as a cause of Mathematics anxiety. It revealed that once students have made several attempts at mastering the content of the subject and fail, they develop anxious feelings towards the subject. A teacher elaborated,

Mathematics comprises various topics, most of which require a systematic application of formulas and calculations to arrive at the correct answer; something which seems to be very confusing and difficult to execute for most students (IMT1S4 - Male).

Similarly, some students averred,

Mathematics is a very confusing subject, actually it requires a high level of thinking capacity, if it could be my choice, I would rather damp it". (FGDS6S2, Male)

Additionally, it was also revealed that incompetence in teaching maths on the part of some teachers also contributed to the prevailing condition of students' mathematics anxiety. One participant stated, "Other [i.e., some] teachers do not seem to master the subject, and they can even confuse students, which actually terrifies them....." (IMT2S6 – Male). Another student also observed that, "teacher's lack of skills to teach and encourage students to learn maths may sometimes make their students become anxious with mathematics" (FGS7S2 - Male).

The study also found that learning disability influences students' mathematics anxiety. During the interviews, one teacher noted, "Actually some students have inborn learning disabilities; to them all subjects are difficult, and when it comes to mathematics the matter is even worse, they are so anxious about the subject" (IMT1S2 – Male). When confronted with this view, a student attested that, "Some of us were born in this way, it is like some of us are having learning disorder and phobia about mathematics" (FGS8S1 - Female).

As shown in Table 3, in this study other factors that contribute to the development of Mathematics anxiety among students include "peer pressure" and parental factors". One teacher noted that "students' negative attitude towards mathematics" were due to beliefs about

the subject that they hold; “. . . [some] students developed mathematics anxiety due to their poor [i.e., self-defeating] belief that mathematics is the most difficult of all [subjects].....” (IMT3S1 – Male).

Teachers’ Strategies for Reducing Mathematics Anxiety

Participants were required to give their views regarding the strategies that Mathematics teachers use to reduce Mathematics anxiety among students. A total of nine major themes emerged from the data, including the following:

Reduce the applications of punishments:

Most of the teacher and student participants argued that, if possible, Mathematics teachers have to avoid or reduce the use of any forms of punishment while teaching. Instead, they should use positive reinforcement strategies to encourage students to learn or do mathematics. One interviewee said:

Corporal punishment is not good per se. Instead of being constructive, it destroys particularly by developing Mathematics anxiety among students. Hence, it will be much better if Mathematics teachers stop relying on this strategy (IMT3S6 - Female).

Avoiding embarrassment or intimidation

Many participants asserted that, to reduce mathematics anxiety amongst students, Mathematics teachers should avoid embarrassing and intimidating students in the classroom teaching-learning sessions. One student commented, “Instead of using threats and intimidation, Mathematics teachers should be caring and supportive. This will make students not develop Mathematics anxiety” (FGS3S5 - Female). Teacher participants in this research supported this view, agreeing that if mathematics teachers avoid threats alongside reducing punishment, students will eventually love mathematics and thus not be afraid of it.

Use of rewards and reinforcement

This was another strategy that was identified. The participants suggested that, where necessary, Mathematics teachers should use rewards and reinforcement of any kind to motivate students and, most importantly, reduce Mathematics anxiety among them. Consider the following statement from a teacher: “A teacher should motivate students with a smile or laughter and give them . . . prizes [for trying] whenever possible..... ” (FGS2S4 - Male). Similarly,

another teacher added; “Students are children, thus when you reward them for practising maths, they are more likely to like it rather than avoiding it” (IMT1S6 – Male).

Organising group work or discussion

Some teacher and student participants stated that “organising group work or discussion” is an effective strategy in overcoming students’ anxiety about Mathematics as it gives students freedom of expression and thereby helps them to develop self-confidence. This is evidenced by the following extract “.....when students discuss among themselves under the teacher’s facilitation they do feel much better” (IMT1S5 - Male). Some students stated group discussion helped them interact among themselves where they are free to teach each other, which in turn make them enjoy the subject rather than avoid it.

Peer teaching

This was mentioned as well by both teacher and student participants as a strategy for reducing Mathematics anxiety among students. The participants stated that peer teaching enables students to interact and help one another. They noted that the practice reduces their anxiety about mathematics, unlike when they are taught by the teacher. This is implied in the response of a female respondent when she said, “To reduce a teacher figure, a peer may act as a teacher to teach colleagues” (IMT3S1 - Female).

Provision of one-to-one support

This was another strategy that was identified in the study. Teacher and student participants commented that if Mathematics teachers dedicate their time to teaching each student and listen to their challenges so as to provide relevant assistance, students’ Mathematics anxiety would lessen. During the proceedings of the FGDs one student remarked “Mathematics teachers should dedicate their time to provide one-to-one support to assist each student little by little” (FGS5S1 - Female).

Engage technology in teaching

Several teacher and student participants argued that technology can simplify the task of teaching mathematics, and thus can have a profound impact in motivating students and making them interested in the subject. A participant noted, “Today technology simplifies work, Mathematics teachers should make use of it to simplify their teaching, which will eventually reduce students to be anxious [sic] about mathematics” (FGS4S6 - Male).

Relating mathematics to real life

A sizable minority of teacher and student participants argued that to make students start to value mathematics and reduce their anxiety about the subject, mathematics teachers should attempt to teach mathematics to students by relating the subject to real-life examples. A teacher explained, “Mathematics is life, we teachers must teach it by relating the subject to everyday life experiences so as to make students be motivated to learn it” (IMT3S6).

Practising mathematics every day

Another sizable minority of teachers and student participants made comments that were in favour of the slogan “practice makes perfect”. One teacher said, “Teachers should guide students to practise solving Mathematical problems every day, whenever possible it should be a habit” (IMT2S5 – Male).

Table 4: A summary of teacher’s strategies for reducing Mathematics anxiety among students

| Strategy | Keywords (responses) |
|--|--|
| Reduce the application of punishments | Avoid beating, caning, slapping, kicking, push-ups, or having students kneel and carry stones |
| Avoiding embarrassment or intimidation | Avoidance of reprimand, mocking, use of bad language, and threats |
| Use of rewards and reinforcement | Use of prizes, rewarding a student, smiling when teaching, making fun with students, being patient, encouraging and laughing |
| Organise group work or discussion | Discussion among themselves, ask one another etc. |
| Peer teaching | One student as a teacher, teaching among themselves, guiding one another |
| Ability to provide one-to-one support | Visit one student at a time, listen to each student, knowing each of your students, taking time to give guidance and counselling |
| Engage technology in teaching | Use technological devices, puzzle games, apply the internet, online learning and using videos for teaching |
| Relating mathematics to real-life | Observing time, calculating distance, counting money and Maths is life |
| Practice Maths every day | Make a habit of solving mathematics, and practice mathematics on every occasion, mathematics as your culture, and practice makes perfect |

Finally, the researchers also sought to know how often Mathematics teacher participants applied various strategies to reduce Mathematics anxiety among students. It was revealed that group work or discussion, peer teaching, practising mathematics every day and relating

mathematics to real life were most frequently utilised by Mathematics teachers in their attempt to reduce the mathematics anxiety of their students. The teachers said that they frequently used these strategies because they are easy to use and effective. Additionally, it was revealed that engaging technology in teaching, providing one-to-one support, and avoiding the use of punishment and intimidation are strategies that were rarely used by teachers in an attempt to reduce mathematics anxiety among students.

Several teacher participants reported that financial constraints and overcrowding of classrooms were the major reasons for the infrequent use of technology and one-to-one support as strategies to reduce Mathematics anxiety. Moreover, it was revealed that some Mathematics teachers found it difficult to contemplate not using punishment and intimidation while teaching due to various reasons. One teacher stated,

sometimes some teachers are forced to use caning to make students work hard and pass in their examinations.....some students have improved their behaviour and performance as a result of corporal punishments” (IMT1S5 – Male).

Generally affirming the interviews current author’s field observations from the participating schools revealed that several Mathematics teachers frequently organised group work/discussions, and peer teaching, made an effort to relate Mathematics to real life, and used rewards and reinforcements. We also observed that while corporal punishments and threats were rarely avoided, unfortunately, technology and one-to-one support were not applied at all.

DISCUSSION

Based on the findings of this study, Mathematics anxiety is a common feeling among students in secondary schools. This is in line with Mohamed & Tarmizi (2010) and Kyaruzi et al. (2020) whose findings indicate that there is a high level of Mathematics anxiety among students in Tanzania. This is not surprising since Mathematics anxiety is a problem affecting many people around the world. Regarding the relationship between mathematics anxiety and gender, the mathematics teachers had views that are in line with the findings of previous studies (e.g. Zakaria et al., 2012; Mohamed & Tarmizi, 2010; Kundu & Kar, 2018) which show that there is no significant relationship between gender and Mathematics anxiety. This is especially true because most students in secondary schools in Tanzania share similar educational backgrounds and socio-economic status. However, in the current research, students’ views on Mathematics anxiety and gender contradicted the findings of some previous studies (e.g., Devine et al., 2012; Chávez, et al., 2017) as they showed that there are differences between males and females;

claiming that females are more anxious over mathematics than their male counterparts. A possible explanation for this is that female students are less active or less involved in numerous extra-mural activities relating to maths compared to male students (Khatoon & Mahmood, 2010). Certainly, girls have lower levels of perceived mastery experience and performance in mathematics than their counterparts because of social pressures regarding girls' aptitude for studying mathematics (Kyaruzi, 2021).

Although there is no consensus among scholars on the factors that contribute to the development of Mathematics anxiety, this study found that students' Mathematics anxiety is a product of eight different factors. Poor academic background in mathematics was found to be the most influential of those factors. Mathematics anxiety normally develops due to an individual's prior experiences (Geist 2010). Beilock & Maloney (2015) observed that it develops before a child enters kindergarten. This implies that if a children start practising mathematics early, before reaching high school, they will be able to master the subject well. Contrariwise, if they have a poor foundation in mathematics during pre-and primary school, they will develop a negative attitude towards the subject and, hence, will have Mathematics anxiety.

Although many of the factors for the development of mathematics anxiety among students identified in this study are similar to those which have been reported globally, the present study establishes that children's socio-economic backgrounds have a great influence on negative feeling about Mathematics as Geist (2010) argues. According to Geist, children with poor socioeconomic backgrounds often have less educated parents who hold negative attitudes towards mathematics, a situation that significantly affects their children. Thus, it is not surprising that the negative attitudes towards Mathematics are highlighted in the findings of this study since most students in Tanzania belong to families with low socioeconomic backgrounds. This study also supports the findings of previous studies (Mazana et al., 2020; Chávez, et al., 2017) that students' negative attitude towards mathematics is due to their preconception that mathematics is the most difficult subject. To sum up, while other factors are associated with the students themselves, others are associated with the teachers, particularly those teaching styles that involve punishments and threats. This is not surprising because most Tanzanian schools have a dire shortage of qualified teachers of Mathematics (Mohamed & Tarmizi (2010), and the available ones lack competent Mathematics teaching skills (Masele & Twelve, 2018; Mazana et al., 2020). This is consistent with the findings by other authors (Bekdemir, 2010; Finlayson, 2014) who found that the teaching styles used by Mathematics

teachers constitute a major factor that contributes to the development of Mathematics anxiety among students.

To address the factors that influence the development of mathematics anxiety among students, this study unveiled several strategies that teachers can utilise in overcoming students' Mathematics anxiety. These include reducing punishments, use of rewards and reinforcement, peer teaching, use of group work, and discussion, engaging technology and practice mathematics. Many of the strategies depend largely upon teachers' pedagogic practices. This suggests that teachers play a crucial role in overcoming these negative feelings (Versile, 2013; Geist, 2010; Hellum-Alexander, 2010). Based on the findings, it can be concluded that, although the teacher is partly the source of students' mathematics anxiety, they also play a crucial role in reducing the problem. Nevertheless, although Mathematics teachers in Tanzania were aware of the necessity of utilising various strategies in reducing Mathematics anxiety, most of them said due to various reasons that they were not able to use some of the strategies. One of the reasons was the overcrowding of classrooms, which was confirmed by the current researchers through direct classroom observation. This is consistent with Tamasha (2012) who found a teacher-student ratio in Tanzanian secondary schools was 1:88, which is much higher than the target ratio of 1:45 recommended by the Tanzania Education Policy of 1995. The situation was even worse in some schools as the ratio was so high to the extent that it was difficult to comprehend when teaching was taking place.

Furthermore, several Mathematics teachers argued that punishment and intimidation as strategies cannot be entirely discarded since they help many students to work hard and focus on their studies and contribute to improving their performance. These teachers' arguments confirm the notion that most teachers in Tanzania are not friendly to their students during the teaching-learning sessions (Ngussa & Mbuti, 2017) and believe that corporal punishment plays a greater role in improving students' performance (Omari, 2006). During the field observation, the researchers witnessed some Mathematics teachers using corporal punishment to discipline students when they misbehaved or gave a wrong answer to Maths questions in the classroom. This is because Mathematics teachers believe that students cannot achieve improved performance without the application of punitive measures to make them study hard.

CONCLUSION AND RECOMMENDATIONS

The study establishes that the teachers are familiar with the teaching strategies used to reduce Mathematics anxiety among students. However, most of these strategies are rarely applied by

Mathematics teachers when teaching. It was revealed that the mathematics teachers were willing to utilise different strategies including those which are rarely used by them but they failed to do so due to various challenges which include overcrowding of classes and lack of appropriate technologies and equipment. Therefore, it is logical to conclude that, though the role teachers could play in reducing students' Mathematics anxiety is crucial, relying solely on teachers' strategies cannot help to successfully overcome students' Mathematics anxiety. However, this does not rule out the important role that teachers have in achieving this. Thus, we urge teachers to transform their method, change their minds and do away with their reliance on punitive methods and intimidation as a strategy for improving students' performance.

The authors of this paper recommend that, though a teacher plays a vital role in reducing students' mathematics anxiety, conjoint efforts by all education stakeholders including policymakers, school administrators, teachers, parents, students and community members are necessary to help students overcome this detrimental feeling about mathematics in the country. The Ministry of Education and Vocational Training should conduct in-service training for Mathematics teachers to sensitise them to the application of different strategies for overcoming students' Mathematics anxiety.

This study was confined to a few selected public secondary schools, hence, it has limitations in terms of generalisation to other similar situations and private schools in particular. Hence, similar research could be conducted in other areas to find out if mathematics teachers are aware of mathematics anxiety and if they apply different strategies to reduce it among their students.

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